THE IRON AGE

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Bolt and Nut Making at Gary, Indiana

An Illuminating Example of Modern Manufacturing Plant Design in the Works of the Gary Screw & Bolt Company

The tonnage of steel products manufactured in the Chicago district has trebled in a decade. In 1901 the output of finished steel at Chicago was approximately 1,400,000 tons. In 1911 this total had increased to 4,000,000 tons, which was considerably less than the productive capacity at that time. The particularly significant feature of the increase has been the establishment in the past year of Western branch plants by Eastern interests for the manufacture of the more highly finished products. Of this, the new capacity in rivets, bolts, screws and kindred materials has been an especially prominent example. Following the building of a rivet, bolt and nut plant by the Inland Steel Company at its Indiana Harbor Works, the Gary Screw & Bolt Company has just completed an exceptional works at Gary, Ind., and construction has been begun in the East Chicago-Calumet district on plants for two Ohio companies manufacturing similar products.

Fig. 1—The South End of Bay No. 3 Showing Row of Bolt Heading Machines and Heating Furnaces on the Left, the Central Sorting Table with Belt-Driven Arrangement for Pointing Bolts and on the Right a Battery of Bolt Threading Machines

The Gary Screw & Bolt Company was organized by the interests represented in the Pittsburgh Screw & Bolt Company, Pittsburgh, to build a Western plant for Western business. The plant unit just completed and now in operation affords a productive capacity of 2000 tons of finished materials monthly. It is located on a tract of 20 acres about two miles east of Gary, and is served by the Elgin, Joliet & Eastern Railway Belt Line. The equipment of the plant provides for the manufacture of a full line of carriage and machine bolts, hot pressed and cold punched nuts in all finishes, foundation bolts, lag screws, cap screws, rivets, tie rods and upset rods in sizes up to and including 6 in. Much of the equipment consists of machinery developed by this company, including special bending rolls for bending pipe bands to any radius, automatic bolt pointing and threading machines and nut finishing machinery.

The General Plan of the Works

The manufacturing building is arranged with ten parallel bays, and the bays extend in a north and south direction. The building is about 400 ft. long from north to south and about 600 ft. wide from east to west, and affords a total enclosed floor area of 255,000 sq. ft. Except for three north and south tunnels in which railroad spurs pass through the building and one transverse east and west transfer tunnel, which divides the floor area into north and south portions, this area is a continuous concrete flooring, laid at car floor hight above ground level. The building superstructure, fabricated and erected by the Riter-Conley Mfg. Company, is a light steel framework carried on concrete foundations and enclosed on sides and roof with painted corrugated sheeting. The side lighting consists of two rows of ordinary sliding sash and the roof arrangement comprises several parallel gables with simple monitor construction.

Fig. 2—View of the Machine Shop Located in the North Half of No. 1 Bay Showing Individual Motor Drive for Each Tool

The three shipping tracks enter the building at yard grade by reason of the floor tunnel arrangement, the car and shop floors being at a common level. These tracks enter one at each side of the building, traversing the No. 2 bay and the No. 10 bay, while the third traverses the No. 7 bay in the center of the building. This arrangement of trackage is in keeping with the general plan whereby, on the one side, stock for hot pressed and cold punched nuts and for cold headed bolts is unloaded from the east track and moves through the various finishing processes toward the shipping floor in the center of the building, while in similar fashion stock is unloaded from the west track for bolts and rivets and, moving eastward, also arrives at the center of the building for inspection, packing and shipment by way of the central shipping track.

For handling materials within the shop each bay is traversed by an overhead crane of which five have a capacity of 3 tons and three a capacity of 10 tons. The central bays, in which the material is prepared for shipment, require no overhead handling arrangement, as the weights moved are light. A typical view of the crane arrangement is shown in Fig. 3. For the east and west handling of materials a truck is operated in the transfer tunnel mentioned. The passage of various tunnels in the shop is negotiated either by means of temporary gangways or by the concrete steps shown in Fig. 2 and conveniently placed in the lines of travel throughout the shop.

For Machining Products and Forging Large Bolts

For making its own dies and for machining such products as are turned and finished, a complete machine shop is installed in the north portion of bay No. 1, as illustrated in Fig. 2. With but one or two exceptions throughout the shop, each machine is driven by an individual motor. This feature is conspicuous in the several illustrations. The machine shop equipment includes seven 16-in. Von Wick Machine Tool Company lathes with adjustable-speed direct-current Westinghouse motor drive; one Rahn-Larmon screw cutting lathe; three No. 3 Cincinnati horizontal-spindle milling machines; a Mueller 36-in. radial drilling machine; a Garvin die slotter; a Rockford 30-in. planing machine; five 16-in. and one 24-in. Rockford shaping machines; a Jones & Lamson 2 x 2½-in. bolt cutting machine and a Newton circular saw.

Fig. 4—View in the North End of Bays No. 3 and 4, Showing the Rivet Heating Furnaces, the Rivet Machines and Row of Five Presses. The Arrangement of the Machines with Reference to the Floor Tunnel and the Layout of the Motor Drives is Apparent

Fig. 3—View in the North Half of Bay No. 2 Showing Bar Stock for Rivets, 10-Ton Crane, and the Concrete Pocket for Stock Failing to Pass Inspection. The Three Long Heating Furnaces for Rivet Stock with Motor-Driven Blower Arrangement in the Adjacent Bay No. 3 are Also Shown

The south end of this bay is devoted to the forging of dies, the making of bridge and upset rods and the forging of large and special bolts. The equipment provided includes a 1500-lb. Erie steam hammer from which die stock is worked down from billets and a Tate-Jones oil-burning heating furnace. The rod and bolt machinery includes a heading machine with capacity for upsetting rods 1 in. diameter to 1½ in. and up to 6 in. from 5-in. stock. It is belt driven from a motor with a suitable oil furnace for heating. There is also a 6-in. bolt-threading machine, a double spindle 2½-in. bolt threader and a 1-in. bolt threader, all of the type manufactured by the Acme Machinery Company, Cleveland. A United Engineering & Foundry Company bar shearing machine completes the installation. The location of this heavy work in this particular portion of the shop at once isolates it from the regular channels in which the lighter material moves and at the same time reduces the handling of stock to a minimum, inasmuch as the finished material may be loaded out on the adjoining track upon which the raw material is also brought in. This bay is spanned by a 10-ton Alliance crane.

Making Bolts and Rivets

Bay No. 2 is used entirely for the storage of bar stock at the north end for rivets and at the south end for bolts. In Fig. 3 the rivet stock is shown, and in Fig. 5 the bolt stock. Fig. 3 also illustrates a concrete floor pocket into which pieces failing to pass inspection may be conveniently discarded and subsequently removed.

Views of the Tate-Jones rivet heating furnaces and the rivet machines are shown in Figs. 3 and 4. The group includes three long furnaces with three large machines, one of Ajax and two of Acme Machinery Company's manufacture, and three smaller furnaces and machines, making rivets from ½ in. to 4 in. in diameter. The machines are placed in a row above a floor conduit in which oil and water piping is laid and in which suitable receptacles are placed for receiving the finished rivets discharged by gravity from the machines. The larger machines are ar-

Fig. 5—South End of Bay No. 2 Showing Track for Incoming Stock and Unloaded Material for the Smaller Size Bolts. At the Right are the Bar Shears and in the Adjacent Bay, the Heating Furnaces

Fig. 6—View Looking North in Bay No. 6, the Central Shipping Bay Showing the Shipping Track. Bays No. 5 on the Left and No. 7 are also Devoted to Sorting and Packing for Shipment. The Overhead Toilet and Lavatory Spanning the Center Bay is Conspicuous

ranged in a straight line with the long furnaces, the bar stock charged into the furnaces at one end, feeding directly into the machines from the opposite end. The smaller machines on which short bars are worked up are placed diagonally in front of the corresponding furnace, and with the axis of the machine at right angles to the center line of the furnace, a natural arrangement for the handling of the stock from furnace to machine. The heating chamber of the long furnaces is approximately 21 x 3 ft. and of the small furnaces about 5 x 3 ft. Air for the furnace blast is furnished by motor-driven American Blower Company blowers, the blower and air connections for the three large furnaces being shown in Fig. 3. The blast pipe for the smaller furnaces is carried from a blower at the opposite end.

At the south or opposite end of bay No. 3, a view of which is shown in Fig. 1, is the bolt-making department. The present equipment for making bolts includes 11 Tate-Jones heating furnaces, and correspondingly eleven heading machines, of which nine were furnished by the Pawtucket Mfg. Company, Pawtucket, R. I. Of the remaining two, one was built by the National Machinery Company, Tiffin, Ohio, and the other by the Acme Machinery Company, Cleveland. The furnaces are placed consecutively in a row along the building columns, with fronts to the north and bridging a floor conduit which extends under all of the furnaces and carries the oil and water piping. The air blast is piped from blowers, one at each end. A platform is placed over the open tunnel in front of each furnace for the furnace attendant to stand on when handling the stock in and out of the furnace. The row of machines parallels the row of furnaces. The bar stock is cut into short lengths on the bar shearing machines shown in Fig. 3, one a National Machinery Company guillotine frame shearing machine and the other a Williams, White & Co. vertical open-gap bar shear with adjustable stop attachment.

In the center of the bay is a long sorting table, Fig. 1, divided into top compartments corresponding to the heading machines opposite. Along the edge of the table ten chucks are mounted, in which the ends of the bolts are pointed preparatory to threading. These chucks are driven by belt from a shaft mounted on the table framing below. The remaining side of the bay is occupied by a battery of bolt-threading machines consisting of four 3-spindle and six 2-spindle Acme machines and two National ma-

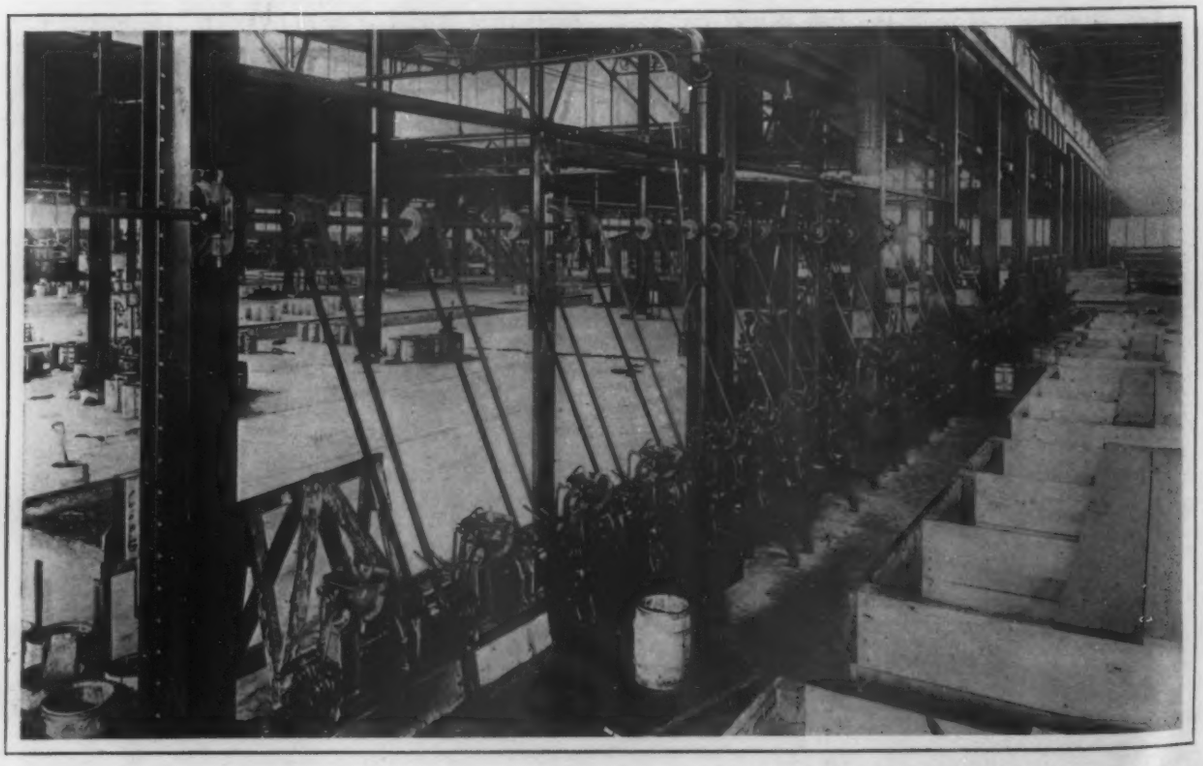


Fig. 8—The Row of 16 Horizontal and 6 Vertical Nut Tapping Machines Located in Bay No. 8 for the Cold Punched Nuts

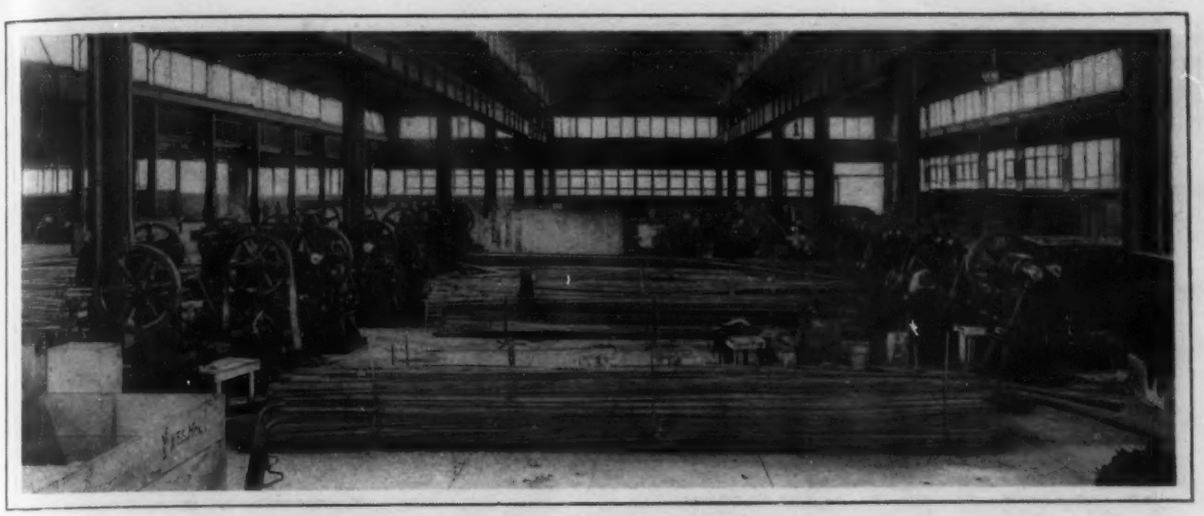


Fig. 7—View of the Cold Punched Nut Department in Bay No. 9 Showing the Presses on Both Sides with the Bar Stock Between. In the Background Beyond the Transfer Tunnel is the Cold Heading Bolt Department also Shown in Fig. 9

chines. For rolling threads two small and one large Waterbury Farrel Foundry & Machine Company's thread rolling machines are installed. Two tumbling barrels are located in this bay for the cleaning up of the finished stock. The above arrangement provides for a movement of the material across the bay from west to east in accordance with the general direction of material movement in the west half of the works. The bar stock is sheared into short lengths and it is piled in racks near each furnace and is handled across the face of the furnace to the corresponding heading machine, thence to the sorting table for pointing and delivery to the threaders. The five trimming presses for trimming the bolt heads are arranged in a row adjacent to the rivet machines, as shown in Fig. 4. Bay No. 4, adjoining, is occupied almost entirely by storage bins for rivets and bolts.

Department for Cold Headed Bolts

On the east side of the plant, including bays Nos. 10, 9 and 8, the materials move from east to west toward the central packing and shipping floor. On the portion of the floor north of the transfer track is the department for cold-headed bolts in sizes from 3/16 in. to ¾ in. diameter. The incoming materials track traverses bay No. 10 immediately inside of the east wall of the building, leaving the remainder of the floor in that bay for the storage of wire and wire rod stock for the bolts. In the adjoining bay, No. 9, the automatic machines for cold forming of the bolts are located, being so placed that the stock can be fed into the machines from the place where it is unloaded with the least possible subsequent handling. A general view of this department is shown in Fig. 9. The equipment consists of nine E. J. Manville cold-heading machines, three open and three closed-die Waterbury Farrel heading machines. For squaring the bolt heads six E. J. Manville automatic trimming machines are arranged in a parallel row.

For the cut thread bolts special automatic self-feeding machines designed by the company are installed for pointing and threading. The row of twelve of these machines is shown in the foreground of Fig. 9. For rolled-thread bolts four Waterbury Farrel thread-rolling machines are conveniently located. The arrangement of this equipment is in consecutive rows in the order of the several operations, so that the movement of the material in the process of completion is continuously toward the packing floor.

Fig. 9—View Into the North End of Bays Nos. 8, 9 and 10 Showing the Cold Heading Department. In the Rear is the Wire Stock in Bay No. 10, in Bay No. 9 a Row of 15 Heading Machines and a Row of 6 Automatic Head Trimmers. The Row of Machines in the Foreground Includes 12 Automatic Self-Feeding Machines for Pointing and Threading and 4 Thread Rolling Machines

Fig. 10—View in the South End of Bay No. 10 Showing Hot Pressed Nut Department Containing Seven Nut Machines and Heating Furnaces. The Arrangement of Incoming Track, 10-Ton Handling Crane and Bar Storage are Apparent

The view of this department also shows the annealing ovens. These are of the type equipped with rotating cylindrical furnaces, inclined sufficiently to feed the material out of the opposite end automatically.

Making Hot Pressed and Cold Pressed Nuts

In the south end of No. 10 bay are located the heating furnaces and machines for making hot pressed nuts. The equipment provides for the manufacture of nuts ranging in size from ½ in. to 3 in. The bar stock is unloaded from the cars immediately in front of the furnaces. This is shown in Fig. 10. This view also illustrates the arrangement of the furnaces and machines with respect to each other and to the line of building columns. The usual practice has been adhered to in placing the machines with an alignment parallel to the run of the building, while the center lines of the furnaces are rotated at such an angle that the operator handles the heated bars into the machines with a half turn and ample clearance. The machines span a floor tunnel similar to those previously mentioned and into which the finished nuts are discharged by gravity.

The cold-punched nuts, in sizes from ¼ in. to ¾ in., are made in bay No. 9, adjoining the hot-pressed nut department. The arrangement of the floor space, as illustrated in Fig. 7, provides for the storage of bars in the center with a flow of vertical nut presses on either side. Of these cold punching machines there are 17 in all, placed five on the east side of bay No. 9 and seven on the west side. The remaining five are in the adjoining bay, No. 8, in a parallel row. At the extreme south end of bay No. 9 three continuous nut burring machines of interesting type are installed. They are illustrated in Fig. 11. The frame is similar to that of an inclined punch press, and carries an upright rotating shaft with a cutter head for facing off the fins on the nuts that are placed in the sockets of a rotating chuck mounted in a horizontal position. The nuts are placed in the chuck sockets by girl operators, and when faced off they drop out by gravity.

The center portion of the south end of bay No. 8 is occupied by storage bins. Arranged in rows on either side are the nut tapping machines. The group of machines for the tapping of the smaller size nuts is shown in Fig. 8. These machines were built by the Acme Machinery Company, and include 16 horizontal spindle machines in two sizes and 6 vertical 6-spindle machines. For the nuts of larger size a group of National vertical 6-spindle nut tapping machines is located at the extreme south end of the bay, adjacent to the nut burring machines. Fig. 12 illustrates this group, which includes seven machines handling a medium range of sizes and three larger machines.

The liberality with which provision has been made for

Fig. 11—View Showing the Three Continuous Nut Burring Machines at the South End of Bay No. 9.

Fig. 12—View in the South End of Bay No. 8 Showing Battery of Ten Vertical Nut Tapping Machines for Hot Pressed Nut Department

sorting, packing and shipping by the allotment of the entire floor area of the three center bays is illustrated in Fig. 6. Shipments may be loaded into the cars from either side and from any point in the length of the building. An additional noteworthy feature of this section of the building, also shown in Fig. 6, is the suspended lavatories that are hung from the roof structure and span the center bay. The flooring is carried on I-beams, while the flooring itself and the side walls are concrete, with an expanded metal reinforcing. Stairways afford access at either end. Economy of floor space, ventilation, accessibility and central location are all obtained in this arrangement.

In the present building the arrangement of the machines and space not yet occupied provide for the installation of additional equipment, while an extension of the entire plant on the unit system has been provided for in the layout and location of the plant now erected.

Canada's Manufacturing Progress

A succinct statement of Canada's progress in manufacturing industry has just been given by the Census Commission: The total value of Montreal's manufacturing output in 1910 was $166,296,972, as compared with $154,306,948 for Toronto. During the decade Montreal showed a gain of 134 per cent., as compared with 164 per cent. for Toronto. Hamilton's total value was $55,125,946, and Winnipeg's $39,490,608. Ottawa came next with $20,924,331. The comparative increases of a few of the leading cities show Sault Ste. Marie and Steelton ahead of all: Sault Ste. Marie and Steelton, 7194.56 per cent.; Calgary, 3893.26 per cent.; Sydney, 2692.26 per cent.; Windsor and Walkerville, 1171.03 per cent.; Hamilton, 293.57 per cent.; Toronto, 243.18 per cent.; Ottawa, 137.18 per cent.; Montreal, 145.81 per cent. In 1910 manufacturers in Canada paid $241,008,416 in wages.

The industrial expansion of the province of Ontario, Canada, is strikingly shown in the annual report for 1911 of the Secretary and Registrar of Ontario. During the twelve months 825 companies came into existence, while licenses to do business in the province were granted to 125 companies incorporated outside of Ontario. Most of the licenses were issued to companies incorporated under the federal act, but a large number represented the appearance of British and United States enterprises. Eighty-nine older companies found it necessary to apply for authority to raise additional capital to take care of the demand for their output.

The Hub Machine, Welding & Contracting Company has removed to its new plant at Twenty-second and Race streets, Philadelphia, Pa. In its new quarters the company has secured an open space of 13,000 sq. ft. on one floor. Its specialties are engine room repairs and ice machinery work, but it has opened a new department for the repair of automobiles in all its branches. It has enlarged its electric and autogenous welding department to double the previous size, and has installed a new system for doing electric welding.

Youngstown's Iron Industry in Civil War Time

A recent issue of the Youngstown Telegram, Youngstown, Ohio, giving local history from its files of 49 years ago, publishes the following item, which shows the importance which the iron industry had attained there so long ago:

"Despite the war, great business activity prevails in Youngstown. Brown, Bonnell & Co., owning the Mahoning Iron Works, are erecting an addition 190 x 106 ft. in which 10 puddling furnaces will be installed. An engine of 500 hp. will be necessary to operate the rolls which will turn our bar, sheet and boiler plate iron and heavy armament plate for gunboats. Shedd, Clark & Co. are making good headway with their main building 65 x 125 ft. and will manufacture merchant iron only. They have 15 furnaces. Shunk, Lane & Co. and Homer Hamilton & Co. are also making great additions. Youngstown will soon have seven blast furnaces, three rolling mills, one steel works and two machine shops and foundries. Population is between 4000 and 5000."

The Southern Aluminum Company

The Southern Aluminum Company awarded to the General Electric Company a $400,000 contract for the electrical equipment for the 40,000-hp. hydroelectric plant at Whitney, N. C., which will supply electricity for the extensive aluminum works to be established at that place. The equipment purchased consists of seven 5000-kw. and two 2500-kw. alternating current generators with all necessary apparatus. The dam of the power plant has been finished and work is now progressing on the power house, while construction is being pushed on the aluminum works proper and 500 concrete cottages for the employees. The development will cost about $10,000,000 and will be ready for operation probably by June of next year. Dr. Paul Héroult, 149 Broadway, New York, is the engineer.

The plant of the National Rolling Mill Company, Mansfield, Ohio, containing three hot mills and two cold mills for making black and galvanized sheets, was sold at sheriff's sale September 28 for a nominal sum to the American Steel Company, Park Building, Pittsburgh. The buyer has received financial inducements from the Mansfield Board of Trade to keep the plant there but may move it to Ellwood City, Pa., where the American Steel Company is now operating wire and wire nail mills. Whether the plant remains in Mansfield or is moved to Ellwood City, it is the intention to add three or five hot mills and several stands of cold mills.

The American Steel Foundries has made public the financial results of operations in the six months ended June 30, 1912, showing a net surplus, after all charges, of $112,229, as compared with a deficit of $259,031 for the 17 months to December 31, 1911. As the present outlook indicates still larger buying of the company's products, the future is considered bright with promise.

The Making of Wootz or Indian Steel

The Smelting of Iron Sands and the Conversion of the Resulting Sponge Into Steel Carried on in Identical Ways for Hundreds of Years

BY A. R. ROY

Wootz steel is made by the Hindus in India and is celebrated for the remarkably hard temper it takes. From this steel the famous Damascus swords were made; for it England was glad to pay the fabulous sum of $30 per lb. before the time of Huntsman. In England it was used for making dies for coining presses and for all purposes which required great strength, homogeneity and fineness of grain. Of late years not much has been heard of Wootz steel in Europe because enough is not made to supply the demands of occidental manufacturers; but in India the native blacksmiths still use it, and many sword makers will use no other steel for the blades they turn out.

Wootz steel is still made in India, although foreign steels are gradually diminishing the annual output. It is made to-day in just the way of 100 or 1000 years ago. Rarely in the past few thousand years has India changed any of the methods of manufacturing her commodities. And it is noticeable that whenever modern methods have been substituted for the historical and traditional processes of manufacture, the product has deteriorated in quality.

Primitive Methods of Winning Ore

The method of making the steel is very simple; nor is there anything complicated in the design of furnaces or any of the implements employed in the manufacture. The iron ore is generally picked up along the river beds or in water courses or on rocky surfaces in the form of small lodestones about the size of pigeon eggs. These are

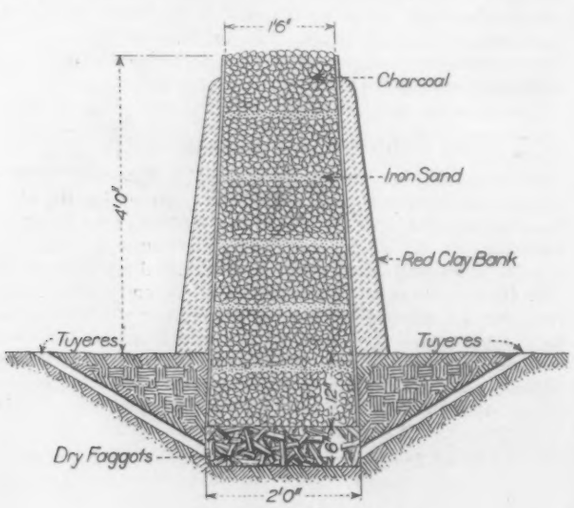


Fig. 1.—Smelting Furnace.

then thoroughly washed until separated from all clay and foreign matter, when they look a dull reddish brown or a bright metallic black. After being cleaned the ore is pounded with large wooden mallets into powder or iron sand.

In the Chota Nagpore district and some other parts rich in iron, long ditches are dug about 3 ft. deep, that terminate in holes about a foot deeper. Such a system of ditches and holes is often called a gravel pit. The gravel pits are filled with water which is allowed to evaporate, leaving at the bottom a deposit of fine iron dust, which is carefully scooped up with the hand for use.

These pits are often inundated with water three or four times before they are abandoned. The quantity of iron deposit gathered, of course, varies with the richness of the field. As a rule, such gravel pits yield enough iron dust every time they are scooped to make 8 to 10 lb. of steel. The gravel pit deposits of India remind one of the lake deposits of Sweden and are probably as pure.

The Most Primitive Method of Smelting

There are three kinds of furnaces used for smelting the iron ore:

1. In a hole dug in the ground.
2. In a long cylindrical furnace.
3. In a brick furnace which is built out of the ground to a hight of 5 ft. above the ground.

Furnace No. 1 is packed or charged in almost identically the same way as the Catalan forges. The iron dust is put on a bed of charcoal, and then covered again with charcoal. Bamboo tuyeres covered with mud are introduced in the bottom of the hole and the air blast is supplied by bellows made of skins that are worked by hand or foot. The fire is constantly supplied with charcoal and iron dust from above. After three to four hours the iron, which looks like a sponge, is pulled out of the fire, carried to a stone and beaten with wooden mallets into a homogeneous mass. Then again it is heated white and beaten into four square bars about 12 in. long and nicked every 4 in. From the time it leaves the fire until it is nicked the iron is never allowed to grow cold. After the bars are broken where they are nicked they are ready to be converted into steel.

A Cylindrical Furnace

Furnace No. 2 (Fig. 1) is a long clay cylinder about 3 ft. above and 1 ft. below the surface of the ground. The base of the cylinder does not rest on the bottom of the hole, but 4 to 6 in. above it. Near the bottom two holes are made in the cylinder on opposite sides and through these are introduced the same kind of bamboo tuyeres as in furnace No. 1, and connected with the same kind of bellows for supplying the air blast. The cylinders have a diameter of about 2 ft. at the base, tapering to 18 in. at the top. The sides are banked heavily with clay to about 3 in. of the opening on top.

These cylindrical furnaces are somewhat more carefully charged. Layers of charcoal and iron sand are alternately packed. The ratio is 1 to 15; *i. e.*, for every basket of iron sand 15 baskets of charcoal are charged. Thus the furnace is charged to the top, the uppermost layer being charcoal. The furnace is fired from below through a hole in the ground which leads to a point below the base of the cylinder. The space below the cylinder is filled with dry faggots over which the first layer of charcoal is arranged. Two men work the bellows continually for four or five hours to supply the air blast. As the burning mass sinks more charcoal and iron and in the proportions mentioned are fed into the furnace. When about 20 lb. of iron has been produced the spongy mass is again treated in the way described, and is then broken into small pieces of bar ready for the crucible for conversion into steel.

Furnace No. 3 is only a modification of No. 2. The only difference is that it is made of brick instead of clay and the tuyeres are placed about 4 in. above ground. There is, however, an important difference in the detail of charging. The ratio of iron ore to charcoal is 1 to 2.

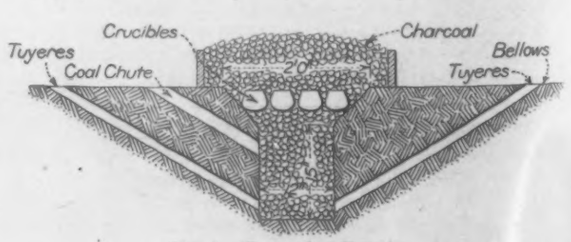


Fig. 2.—Converting Furnace.

This may be explained by the fact that in these furnaces found on the Malabar coast charcoal made of irool wood is employed, and it is better than that from the babool

wood or other species of acacia native to other parts of India. The preparation of the iron for the crucible is always the same.

The Converting Furnace

Whatever be the method and design of the furnace for smelting, the conversion of the iron into steel is the same, and always the same kind of furnace is employed. A hole is dug in the ground about 2 ft. deep (Fig. 2). At 9 in. below the surface the hole is about 1 ft. in diameter, and goes down perpendicularly. In the upper part it begins to spread out till it attains a diameter of 2 ft. at the surface. The furnace is filled with charcoal nearly to the surface. Ten to 14 crucibles are placed on the bed of fuel and then covered over fully with more charcoal, which is kept from scattering by a mud ridge 6 in. high all around the hole. Two tuyeres are sunk nearly to the bottom of the hole at opposite sides. Bellows are used to produce the blast. A little tunnel leading to the hole, say 14 in. below the surface, furnishes fuel. This chute is carefully closed when not in use during the burning. Two men who work the bellows continually for four to five hours replenish the furnace with fuel and carefully regulate the heat. At the end of four hours the crucibles are shaken to ascertain if the metal within is molten. The fires are allowed to die out slowly and the crucibles to cool gradually through the night. In the morning they are broken and the buttons of Wootz steel, called "oolies," and weighing 1 lb. each, are taken out ready for sale. While the steel is hot no cold air is allowed to touch it; in fact, to insure the exclusion of cold air, the fire is kept up sometimes for an hour after the metal has reached the molten state, and then allowed to die out slowly.

Fig. 3.—Shapes of Crucibles and Lid.

The preparation of the clay for the crucibles, as well as the manner of charging them is worthy of notice. Black clay is brought from the bottom of ponds that dot the whole continent, or from the low-lying rice fields. This mud is for some reason supposed to be less liable to crack in great heat. It is mixed and kneaded by trampling Carefully all gravel, hard lumps and stones are removed and the clay is worked until it attains a uniform consistency. Then it is divided into small lumps, each enough to make a crucible. Each of the lumps is mixed with rags shredded and torn into small pieces and beaten with a hammer on a hard surface until the linen is reduced to a pulp and becomes indistinguishable. Then the clay is ready for making crucibles. Goldsmiths prepare the clay for pots in which they melt gold in the same way; otherwise it would crack in the intense heat. In a very large number of cases the clay is prepared by merely mixing it thoroughly with an equal proportion of burnt rice husks. Sometimes the inside of the crucibles and furnace is lined or coated with red clay. Crucibles (Fig. 3) are made in various shapes, and the lids, which are convex, are made of the same material. They seldom have a capacity for holding more than 2 lb. The crucible is charged thus:

A few leaves of the *Asclepias gigantea* are placed covering the bottom of the crucible. Above this come a few pieces of dried wood, the *Cassia auriculata*, in lengths of about 1½ in. and weighing not more than a tenth part of the piece or pieces of iron. The sum total of these pieces of bar iron in the crucible seldom amounts to more than 1 lb. The iron is placed with or above the wood, then the whole is stuffed with the leaves mentioned above to fill up all air space. The less space the better the quality of the steel. Of course, the irregularities in the form of the wood seldom permit the exclusion of all air. Above the covering of leaves the lid is tightly pressed down and luted with the same prepared clay.

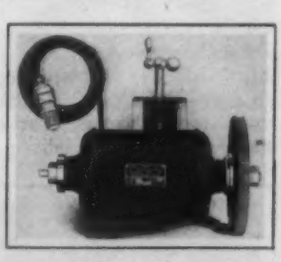
Properties of Indian Steel

Wootz steel is renowned for its malleability and ductility, combined with great toughness. But it is somewhat difficult to work. It gets burnt or decarbonized very easily if the heat is raised above a dull cherry red or the steel is kept long in the fire. At white heat it becomes very brittle and is apt to crack. Nor can this steel be easily recarbonized. A successful method of recarbonizing is employed by Indian blacksmiths, but it requires much care and skill and is rather too complicated to explain here. As a rule, Wootz steel becomes useless once it is burnt. The best results with it can be obtained by working it quickly with the heaviest hammers possible. The remarkably hard temper it can take makes it unique. A sword made with this steel will cut in half at a stroke a floating cocoanut which has not been deprived of its natural fiber covering. It will cut in twain a silk thread floating in the air. Tools of remarkable temper have been manufactured from it.

It is difficult to give a representative analysis of Wootz steel because it is made in various parts of India, and the iron ore used and the method of manufacture are not identical. In some specimens analyzed aluminum has been found; in others there was no aluminum, but traces of graphite, sulphur and arsenic, in addition to the usual carbon and silicon. However, it would appear that the percentage of carbon is pretty high, rising to 1.45 and being seldom less than 1.10. Considering the marvelous results obtained, it would be quite interesting for scientific purposes to conduct a thorough investigation of Wootz steel.

Portable Parallel Grinding Attachment

Accurate work and hard continuous service are the two special features claimed by the Standard Electric Tool Company, Cincinnati, Ohio, for a new portable electric grinding attachment which it is now manufacturing. The special work for which this attachment is designed is the grinding of rolls, shafts, connecting rods, bushings, journals and other similar work after it has been turned in a lathe. In addition to handling pieces of this character it is also possible for it to do surface grinding on a planing machine and it can also be used to advantage on a boring mill.



An Improved Motor-Driven Portable Parallel Grinding Attachment Made by the Standard Electric Tool Company, Cincinnati, Ohio.

The attachment is fastened to the lathe by bolting the angle plate on the tool post rest. If desired a shank can be furnished when required instead of the angle plate attachment. There is a vertical adjustment of 4 in. to bring the attachment in line with the lathe centers. The bearings are made of phosphor bronze and are dustproof and adjustable for wear. As far as possible the mechanical construction has been simplified, the idea of strength and rigidity being carefully carried out.

This machine is made in two sizes, being driven by ½ and 1 hp. motors respectively. The motor is air cooled by a special fan mounted on the armature shaft which gives forced ventilation. The armature and poles are made of soft electrical sheet steel laminations which are well insulated.

Isaac H. Orr, trust officer of the St. Louis Union Trust Company, St. Louis, has been appointed receiver by the United States Court for the St. Louis Blast Furnace Company under proceedings brought by the Whitney-Kemmerer Company, Philadelphia, which enjoined the foreclosure sale of the property some weeks ago. A bond issue of $200,000, on which interest has not been paid, hampers the company, whose plant has been idle for a year. The stockholders have been endeavoring to re-establish the company, but the court decided that sufficient time had been allowed for their efforts and the receivership order is a result.

The Manufacture of Tool Steel

A Description of the Processes and Equipment Used in the Plant of the Columbia Tool Steel Company

BY EDWARD K. HAMMOND, CHICAGO

Fig. 1—A Charged Crucible

The manufacture of tool steel is one of the older industries, but before the application of chemistry to steel making little was known of the reasons for following the various steps in the process. Like many of the older generation of manufacturers, the steel maker worked upon traditional rules which had been slowly developed from the experience of his forebears. The more successful manufacturers laid great stress upon their so-called "secret processes" of compounding the materials from which the steel was made; these methods were jealously guarded and were handed down from father to son as treasured heirlooms.

The Application of Chemistry in Steel Making

But with the application of chemistry in tool steel plants, which took place less than 50 years ago, the way was paved for great improvements, both in the quality of the product and in the facility with which it could be produced. Instead of making his "mix" without knowing the underlying principles, the modern steel maker works with the same degree of accuracy that a druggist observes in putting up a prescription. All of the raw materials are accurately analyzed in the laboratory, and from the knowledge of their composition which is secured in this way the formulæ for the different brands of steel are made up on paper. The total amount of carbon, manganese, sulphur, phosphorus, and other constituents which are to be present in the finished steel is determined by adding up the sum of each which was found by analysis of the raw materials.

In starting upon the manufacture of a new brand of tool steel, a trial ingot is made from the formula which has been developed from the knowledge of the exact composition of the raw materials furnished by the laboratory. When completed, this ingot is analyzed to prove that its composition is in accordance with the formula which was calculated upon the basis of the materials from which the steel was made. From the foregoing, it will be seen that the modern steel maker, assisted by his chemists, works upon the production of steels of predetermined composition, which his knowledge of the properties imparted by different constituents enables him to predict will be suitable for specific classes of service. This contrasts sharply with the haphazard methods of former generations. It is true that this scientific way of going at the manufacture of tool steel has robbed the industry of much of that treasured air of mystery which was formerly in vogue, but, where scientific methods prevail, mystery no longer has a foothold.

It must not be thought, however, that the work of the chemist can produce good tool steel unassisted. The chemist has demonstrated the value of his work, both in compounding the charges of raw materials from which the steel is made and in explaining the principles upon which the process of manufacture works. But unless all of the materials are of the highest purity, and the greatest care is observed in every process through which the steel is passed before reaching completion, satisfactory results cannot be obtained.

The Evolution of Modern Manufacturing Methods

Wrought iron forms the base of all tool steels, and to be suitable for this purpose it must be of the highest purity. The first known form of tool steel consisted of

Fig. 2—General View of the Melting Shop in the Columbia Tool Steel Company's Works

Fig. 3—Teeming Steel Into Molds

wrought iron which had small percentages of carbon combined with it. Such steels are used today under the name of "carbon steels" to distinguish them from the more modern high-speed or alloy steels.

In converting wrought iron into tool steel, the primitive steel maker followed what is known as the cementation process. It consisted of packing bars of wrought iron in firebrick boxes filled with powdered charcoal. Each bar of iron was completely surrounded by the charcoal, the method being to place alternate layers of iron bars and charcoal in the box. When filled, the cover was placed on the box and the joints were luted with fire clay to make them airtight. Two such boxes were customarily mounted in the same furnace, and when the charge had been properly sealed up, to prevent the charcoal from burning, the fire was started under the converting boxes. The heat was regulated in such a way that it took about two days for the boxes to come to a dull red heat, indicating a temperature of 1250 deg. F. At this temperature iron has a slight solvent action on carbon, the latter being taken up to form a carbide of the composition Fe_3C, which is known by the chemical name of cementite.

The rate at which it was possible to convert iron into steel by the cementation process was very slow, experiments having shown that the carbon penetrates into the iron ⅛ in. for every 24 hrs. that the iron in kept at a red heat. As a consequence, it required from 7 to 11 days after a red heat had been attained, to enable the carbon to be absorbed right to the center of the bars of iron. The rate at which the process was progressing was judged by means of small test bars, which were placed in the furnace, where they were readily accessible. After the seventh day, one of these bars was taken out at intervals of several hours and broken, the appearance of the fracture indicating the depth to which the carbon had been absorbed.

When the process of conversion had been completed the fire was allowed to die out, and when the bars of steel had cooled sufficiently they were taken from the furnace. Steel produced by this method is known as "blister steel," owing to the fact that the surface of the bars is covered with blisters, caused by the formation of gas in the steel from a chemical reaction between the slag in the wrought iron and the carbon of the cementite. The bars of blister steel were refined by hammering, and where exceptionally large bars were required they were produced by welding together the necessary number of bars of the size that were converted in the furnace. This process is still used by reputable steel makers in Sheffield, England, although much of the steel thus made is afterward cut up and melted in crucibles.

About the middle of the eighteenth century the more rapid method of converting iron into steel by the crucible process was invented by Benjamin Huntsman, an Englishman, who endeavored to keep his process secret, but was unable to do so. With the advent of the chemist into the steel trade, the crucible process, in which the iron is brought into a molten condition, was of course found more favorable than the cementation process for the application of his art to the production of a steel of predetermined composition. The crucible process, therefore, by reason of the reduction of the time required to produce finished steel, the great saving in fuel and the possibility of securing a product of a desired composition, is now followed by all important manufacturers of tool steel.

Fig. 4—Ingots Stacked According to Carbon Content

Fig. 5—Rolling Mill, with 14-In. Rolls, Used for First Reduction on the Billets

The Development of High-Speed Steels

Before entering upon the practice of a modern tool steel mill a brief account of the development of our modern alloy or high-speed steels will be of interest. These steels were first discovered by Robert Mushet, who found that the introduction of from 4 to 12 per cent. of tungsten and 2 to 4 per cent. of manganese into tool steel gave the product the so-called "self-hardening" properties; that is to say, the steel took a temper upon cooling without being quenched in oil or water. The analyses of the early forms of Mushet steels varied widely, but the average composition is fairly well represented by the following figures: Tungsten, 9 per cent.; manganese, 2.5 per cent.; carbon, 1.85 per cent.

Since the early experiments of Mushet a great deal of attention has been given to the improvement of these so-called alloy steels. This result has been obtained by the combination of a number of other elements than tungsten and marganese to form different tool steels, each of which has its advantages for particular classes of service. The up-to-date steel maker has used such elements as chromium, vanadium, titanium, boron, silicon, uranium, nickel, and even silver in advancing the quality of his product, in addition to the manganese and tungsten originally employed by Mushet.

The first public exhibition of the use of alloy steels was made at the Paris Exposition in 1900. It was shown at that time that tools made from alloy steels and subjected to the proper heat treatment were capable of taking cuts of such a depth that they were heated to redness through the friction of the cut. At the same time these tools were capable of working at such a remarkable speed that the name of "high-speed" steel was given to the stock from which they had been made.

During the past 12 years high-speed steels have been steadily increasing in popularity among the users of machine tools, and builders have been increasing the strength of their machines to enable them to secure the full advantage of the increased capacity of the alloy steels over that which had formerly been possible. A great variety of formulæ have been used in combining the elements mentioned; in general, however, it may be said that the tendency has been to reduce the percentage of carbon from the average value of 1.85 per cent. employed by Mushet to about 0.6 per cent. In tungsten steels the amount of tungsten has been increased from the 9 per cent. called for in the average formula of Mushet to as high as 20 per cent. When given the proper heat treatment it has been found that tungsten, combined with the correct amount of chromium, gives the tool the desirable properties of toughness and red hardness, and that better results are secured by increasing the tungsten and dispensing with the use of manganese. It has also been found that molybdenum can be used in place of tungsten with satisfactory results. In the case of the molybdenum steels the percentage of molybdenum present is about half as great as the quantity of tungsten used, while essentially the same amount of carbon is allowable in either case; chromium is used in quantities ranging from the almost imperceptible up to 6 per cent., and is claimed to give the steel additional hardness. Tungsten and molybdenum have also been combined in the same steel with the production of good results.

Later in the development of alloy steels came a silicon steel developed by Hadfield. The formula calls for 2.75 per cent. of silicon with the smallest possible amounts of manganese, carbon and other impurities. This steel is capable of being hardened by a double heat treatment, but has not found wide application in the production of tools. Its greatest field of usefulness has been in the manufacture of electrical machinery, for which purpose its high magnetic permeability and electrical resistance make it well suited.

The use of vanadium in alloy tool steels has been adopted with satisfactory results. Next to carbon this is the element which has the most powerful effect on the steel; from 0.1 to 0.15 per cent. of vanadium will produce marked results, while the best authorities agree in saying that 1 per cent. of this constituent is the best amount to use in high-speed steels. The use of vanadium in tool steels has been found to give added strength, toughness and temper, and it is also believed that this element has a further beneficial effect in purging the steel of oxygen and possibly of nitrogen.

Up to the present time titanium has not found wide application in the manufacture of tool steel. This element has the valuable property of combining with any nitrogen in the steel and carrying it off in the form of slag. As it is now believed that the presence of even the smallest trace of nitrogen is a serious detriment, the use of titanium would appear to be beneficial. It is of interest to note in this connection that the chemical affinity of titanium is so great that the presence of the slightest trace of titanium in the finished steel is a guarantee that no nitrogen is present.

Before passing from the subject of the composition of different alloy steels it should be mentioned that the figures given do not represent the practice followed by any one company in combining the different elements which go to make up its products. These figures are presented

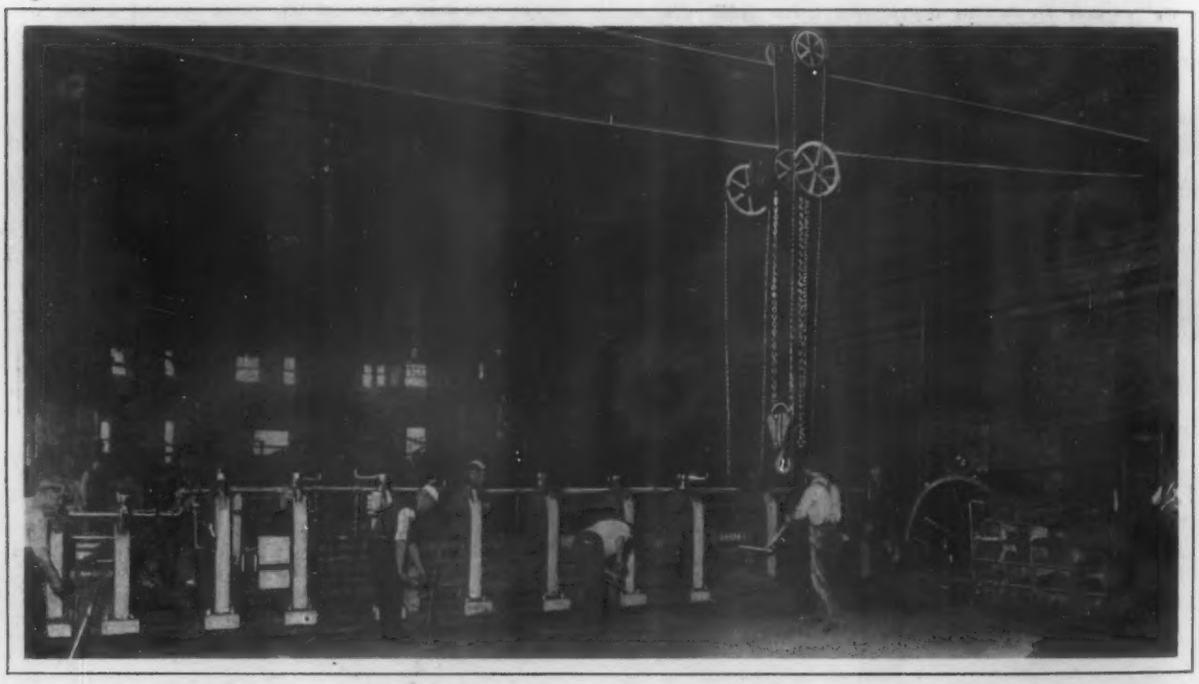


Fig. 6—Rolling Mill with 9-In. Rolls, for Completing Rolled Bars of Tool Steel

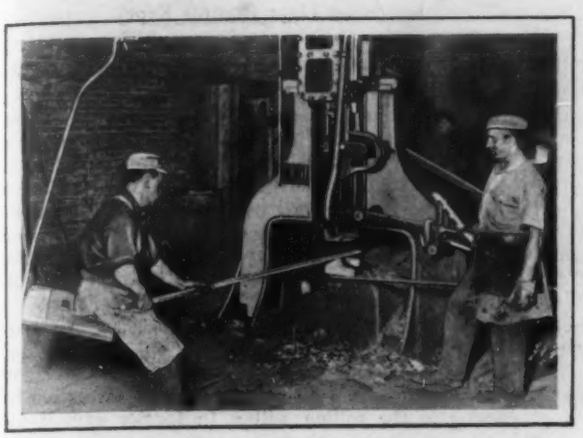


Fig. 7—Tilting Octagon Bars of Chisel Steel

to give the reader an idea of the composition of the different forms of alloy steel which are obtainable upon the market at the present time and represent a fair average of the products of different manufacturers.

The following description of the methods and equipment used in the production of different forms of carbon and alloy steels, and of the way in which the product of the furnaces is worked up into the form in which it appears upon the market is based on a visit which the writer recently made to the plant of the Columbia Tool Steel Company, Chicago Heights, Ill.

Preparing Charges for Crucibles

The crucibles in which the steel is made have a capacity for 100 lb. and the charges are compounded upon this basis. In starting on the manufacture of a given brand of steel the formula is sent down to the "medicine room," which is the name given to the store room in which the raw materials are kept. This room is fitted up with bins for each material, and as the charges are based on units of 100 lb. the required percentage of each constituent is easily added by weighing out the number of pounds and fractions of a pound corresponding to the percentages in the formula.

The wrought iron from which the tool steel is made is imported from the Dannemora district in Sweden and comes to the plant in bars 3 in. wide by $\frac{5}{8}$ in. thick. Pieces 1 in. in length are sheared from these bars for the charge for the crucibles. Even before the science of chemistry had been used in steel making the superiority of this Swedish wrought iron for making tool steel had been recognized, and steel makers explained the fact by saying that it possessed "more body" than similar grades of domestic iron of equal purity. Later and more scientific investigations have shown that the Swedish iron carries slight traces of titanium and vanadium, and as these elements have the power to free the steel of any oxygen and nitrogen which is present, it is now thought that the superiority of such iron lies in their presence.

The required number of pounds of iron for the charge for each crucible is weighed out into sheet metal scoops. The other constituents for the charge are then weighed out into paper bags, and one bag is placed on top of the iron in each scoop. Each scoop thus contains the complete charge for a single crucible and the required number of charges are sent down to the melting shop to fill the number of crucibles which are to be placed in the furnace. A charged crucible is shown in Fig. 1.

The Melting Furnace

After the charges have been placed in the crucibles the latter are transferred to the Siemens regenerative melting furnace shown in Fig. 2, which gives a general view of the steel melting shop. This furnace is arranged with five "holes" in a row and each "hole" has a capacity for six crucibles. The furnace is heated by producer gas which enters through ports at the side of each compartment. There are six ports in each compartment, which are arranged in two rows of three ports each; the gas enters through the lower row and the necessary amount of air for its combustion through the upper row, combustion taking place in the furnace.

The burned gases leave the furnace through a similar set of ports on the opposite side of each compartment. These ports lead to a passageway, filled with firebrick checker work, which leads to the chimney. The escaping gases are at a temperature of about 3000 deg. F., and in passing through the checker work they give up a large part of their heat. After the furnace has been running long enough to get the checker work thoroughly heated, the direction of the flow of the gas and air entering the furnace is reversed. By this method, the gas and air enter the furnace through the heated checker work, becoming preheated to a temperature of about 2000 deg. F. The combustion of the gas adds about 1800 deg., so that the furnace can be maintained at an average temperature of over 3000 deg. When the furnace is running smoothly, the direction of the gas and air is reversed at intervals of 20 min., and the saving in furnace efficiency by utilizing the waste heat that would otherwise be carried away by the gases amounts to considerable.

It requires from three and one-half to four hours to complete the conversion of each charge, and six charges are usually melted in 24 hr. This gives the furnace a total daily capacity of nine tons. The old cementation process takes from 7 to 11 days to complete a charge of from 10 to 20 tons. A comparison shows the increase in product and saving in cost of production which has been made possible through the development of the crucible process. In addition to this benefit, it would have been impossible to produce the modern alloy steels without bringing the raw materials to the fusion point.

The Work of the Melters

The greatest skill is required upon the part of the melter, as the man in charge of the furnace is known, to produce steel of the required quality. Toward the end of the operation, the furnace must be given constant attention to insure the removal of the crucibles at just the proper time. If the heat is continued too long, the steel will have a very close grain but will have a scalded appearance, while if the crucibles are drawn from the furnace too soon the metal will have a porous structure, due to the presence of gas that is left in the steel. Where the crucibles are left in the furnace too long, the metal is found to be hard, brittle and weak; this condition being generally known under the name of a "dry heat" by the experienced crucible steel maker.

When the heating process is completed, the crucibles

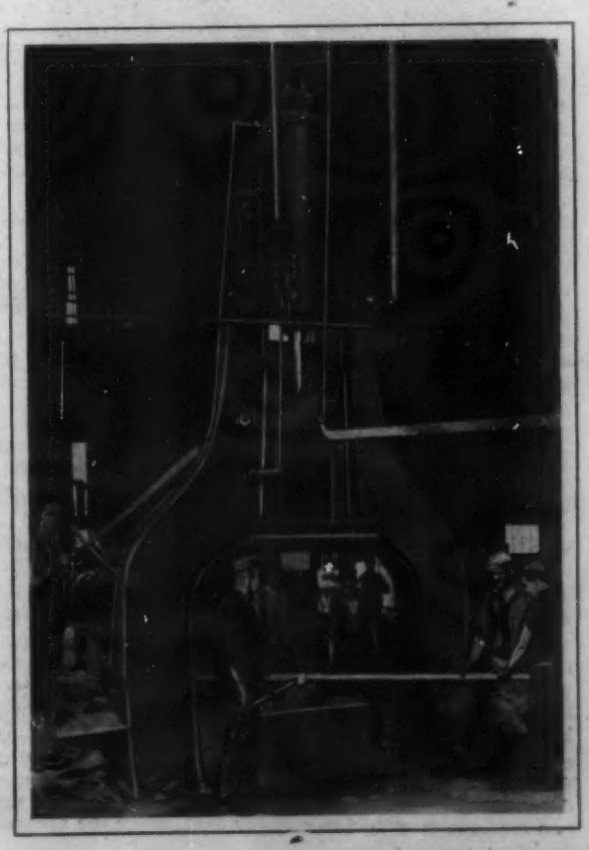


Fig. 8—Working on a Bar of Tool Steel with a 3500-Lb. Hammer

are drawn from the furnace by men who straddle the pits and seize the crucibles with long-handled tongs. The work is very severe, owing to the high temperature of the brickwork, and the men have to be carefully protected; for this purpose, their feet and legs are bound up in wet cloths and their hands and arms are protected by long cloth mittens saturated with water. A mask is worn to cover the head and face; this mask is equipped with blue glasses to protect the eyes from the blinding glare of the white heat of the furnace lining.

As the crucibles are lifted from the furnace, they are carried to the edge of the melting floor, where a row of molds is arranged to receive the steel. Before pouring the steel, a small piece of metallic aluminum is dropped into each crucible. This is done to free the steel of the last traces of oxygen, the aluminum having the property of combining with the oxygen and carrying it away in the slag; none of the aluminum remains in the steel.

The process of pouring the steel from the crucibles into the ingot molds is known as "teeming." This work is shown in Fig. 3, where will be seen a row of molds set up to receive the molten steel. These molds are made of iron. They are cast in two parts, each of which consists of two sides and half of the bottom, the mold being split across the corners. The molds are held together with iron rings and wedges. Each mold holds the contents of a single crucible, so that 100 lb. of steel is cast in each ingot. It is occasionally necessary to produce an especially large-sized bar of tool steel, and for such purposes a large mold is used into which the contents of the required number of crucibles can be poured. The insides of the molds are smoked before the steel is poured into them so that the metal will not stick.

The Treatment of the Ingots

After the steel has been poured into the molds, solidification begins to take place when the temperature has dropped to the "freezing" point. If no precautions were taken, the upper part of the ingot would be the first to solidify. The hot metal within the ingot would then continue to cool and the consequent contraction would cause a cavity in the upper part. Such cavities used to make the upper third of each ingot defective, and it was formerly necessary to reject this portion before starting to work up the steel into bars.

On the expensive alloy steels, the loss caused by the rejection of this upper third of each ingot was so great that it became necessary to find some way of avoiding it. The method now in use was finally hit upon. It consists of placing a white hot brick, called a "hot top," in each mold on top of the molten metal. These bricks are of just the right size to fit loosely in the molds, and have a hole running through the center of them. After each brick is placed in position, enough steel is poured in to just fill the hole through its center. The heat carried by these bricks is usually sufficient to prevent the upper portion of the metal in the molds from solidifying ahead of the rest of the ingot; but should this take place, the molten steel carried in the hole in the "hot top" runs down and fills any cavity that forms in the top of the ingot.

After the ingots have cooled sufficiently, they are removed from the molds and tested for their carbon content by the method of "fracture." This is done by cropping off the end of the ingot and estimating the amount of carbon in the steel from the appearance of the freshly fractured surface. The experienced steel maker is able to judge the amount of carbon in the steel very closely by this method, and the ingots are sorted out and piled in separate stacks, Fig. 4, according to their carbon content. The method of determining carbon by fracture has been handed down to the modern steel maker from the early days of the industry, but with this important difference: The old-time steel maker depended entirely upon the fracture method for the determination of carbon, while the modern steel mill has the results of the determination by the fracture method verified in the chemical laboratory. In skilful hands the fracture method is really extremely accurate, as the Columbia Tool Steel Company found that during the course of a year the maximum difference between the determination of carbon by the two methods amounted to 0.07 per cent., while the average deviation was far less.

Individual Ingot Records Kept

One of the niceties of the tool steel industry lies in the fact that a record is kept of each ingot from the time of the first inspection until the finished bars of steel that are made from it reach the stock room. The steel as it exists in the ingots has a crystalline structure, and in this condition it would be useless for making tools. In order to change the structure from this crystalline form to the fine-grained steel used by the tool maker, the ingots are subjected to a hammering process. After being brought to a forging temperature in coal-heated furnaces, they are taken to a suitable-sized steam hammer and subjected to a thorough hammering; this breaks up the crystals that were originally present in the steel and gives it a very fine grain.

After receiving this hammering treatment, the billet, as it is then termed, is subjected to a second inspection before passing to the rolling mills. In former days it was thought that the best tool steel was made by hammering down the ingots into finished bars. For small sections, however, equally good results can be obtained by rolling, provided the grain of the steel has been refined by a preliminary hammering process. As a rule it is not considered good practice to roll bars of tool steel that are over 3 in. in diameter, on account of the difficulty which exists in getting an equal degree of compression throughout the metal. Such bars are best finished by hammering, and in performing this work it is important that the weight of the blow of the hammer shall be proportional to the size of the finished bar. A large hammer would crush a small-sized bar, while a small hammer would merely refine the surface of a large-sized section.

The Rolling Mills

Where the billets are to be reduced to bars by rolling, they are reheated after receiving the second inspection and then transferred to the first rolling mills. These mills are of the three-high type. Such mills have three rolls which rotate in such a way that the billet is passed back and forth, going over the middle roll in traversing in one direction and under it in making the return passage. The mills shown in Fig. 5, having rolls 14 in. in diameter, receive a billet that is 3 in. x 3 in. x 36 in. in size, and after it has gone through each "pass" in the mill it has been reduced to a bar about 1½ in. x ½ in. x 36 ft. in size.

Some of the bars produced in the first set of mills are transferred, after being reheated, to a second set illustrated in Fig. 6, where they are reduced to still smaller forms in which they are placed upon the market. The process of rolling steel requires the same degree of exacting care which was observed in the melting operation. The steel cannot be heated above certain safe limits, and as these limits vary with the nature of the steel, it is evident that the experience of the men in charge of this work plays an important part in the quality of the product which they turn out. After the rolling operation has been completed, the bars of steel are sheared into standard stock lengths; they are then sent to the stock room for final inspection.

The Hammers

Some classes of tool steel are reduced to their final form under the hammer. This is work that requires a peculiar degree of skill on the part of the men, as they are guided merely by their eye in producing work that comes remarkably close to a standard-gauge size. The operation of producing octagon bars of chisel steel will serve as a good example in presenting a description of this work. The old method of producing bars of this section was to use a tilt hammer set at the right angle to produce the octagon sides of the bars. These old hammers worked at a speed of about 40 strokes per min., and the bar was passed back and forth over the anvil until it was completed. This style of hammering has been found too slow to meet the requirements of modern methods of manufacture, and the old tilt hammers have been replaced by up-to-date steam hammers which work at an average speed of 280 strokes per min. On account of the original method of producing these bars under tilt hammers, however, the old name of "tilting" has still been retained for the work of hammering out octagon bars and the men who do the work are known as "tilters."

The modern method of tilting under a steam hammer

is shown in Fig. 7, where it will be seen that the tilter sits on a seat that is suspended from the ceiling by a single chain. This seat is at such a distance from the floor that the man can move back and forth by changing the position of his feet. The tilter has a helper to assist him in carrying the bars of steel from the heating furnace and by controlling the operation of the valves which admit steam to the cylinder of the hammer. Square bars of stock, of the correct size, are used for the production of octagon bars under the hammer. These bars are heated at one end in a furnace; they are then brought to the tilter, who works down the corners under the hammer until the desired shape and size have been secured. This end of the bar is then subjected to a light hammering to give it the desired finish. The opposite end of the bar is then given exactly the same treatment, and when the work is completed the bar is perfectly straight and so accurately finished that one would almost imagine it had been subjected to some machining operation. Another hammer is shown in Fig. 8.

Annealing

The finished tool steel is so hard that it would be extremely difficult, if not impossible, to work it up into tools. For steel that is to be used in such tools as milling cutters, the steel must be annealed in order to soften it sufficiently to render it easy to work with. Some purchasers call for annealed steel, and to meet this demand a part of the finished bars are sent to the annealing department before going to the stock room.

The annealing process is carried on by packing the bars of steel in tubes filled with powdered charcoal. These tubes are heated in a furnace for about eight hours, where a certain definite temperature is maintained, the temperature varying with the kind of steel which is being annealed. After the heating has been carried on for the required length of time, the tubes are withdrawn from the furnace and allowed to cool gradually. Owing to the protection afforded by the tubes filled with charcoal, it takes about 72 hr. for the temperature of the steel to come down to that of the surrounding air, and at the end of that time the steel bars will be found quite soft and as easy to machine as ordinary machine steel.

Annealed steel is readily distinguished by its color from that which has not received the softening treatment. The unannealed steel is covered with a black coating of iron oxide that has been formed during the different heat treatments through which the steel has passed. During the annealing operation this oxide is reduced by the action of the hot carbon, a gas known as carbon monoxide being formed, and the surface of the bars is reduced to pure metallic iron which is a light gray in color.

The Care Taken at Every Step

Each bar of tool steel which enters the store room is stamped with a number corresponding to the number in the record book that shows the results of the inspections and analysis made on the steel in the ingot from which this particular bar has been made. It will be remembered that the ingots were sorted out according to their carbon content; consequently the bars of steel coming into the store room are already separated upon this basis, and are ready to be arranged in racks bearing the marks of the respective brands.

A brief description has now been given of the care which must be exercised in the selection of raw materials and in conducting each step of the process of manufacture in order to produce high-grade tool steel. But for tools to give satisfaction in any class of service, they must be made of steel that is suitable for the purpose. From this fact, it will be seen that the experience of the tool steel maker must extend in still another direction, for he must be competent to advise in regard to the particular brands of steel that are best suited for making tools for specific classes of service. This is a matter of the greatest importance, for a given grade of steel may give excellent results upon certain classes of work and fail entirely in other classes of service.

The Primos Chemical Company has rebuilt the burned portion of its works at Primos, Delaware County, Pa., and the plant has been in full operation again since September 10. It was entirely rebuilt of brick and iron and is fireproof. This company manufactures tungsten, molybdenum, ferrovanadium, ferrotungsten and ferromolybdenum.

Cambria Steel Company President

William H. Donner Elected by Directors to Succeed Charles S. Price

William H. Donner, who has been well known in the steel trade of the Central West since the late nineties, has become president of the Cambria Steel Company. At a special meeting of the directors of the company held at Philadelphia, September 26, the chairman, E. B. Morris, reported on behalf of the executive committee, to which had been referred the resignation of Charles S. Price as president and the official changes necessary in view of it. The resignation of Mr. Price having been formally accepted, the committee reported that W. H. Donner, of Pittsburgh, had consented to become president of the company. Mr. Morris accordingly nominated Mr. Donner for the office and he was elected. J. L. Replogle, assistant to the president, who has been directly in charge of operations at Johnstown in Mr. Price's recent absence, was elected a vice-president. It was stated that Mr. Donner

WILLIAM H. DONNER

would continue to reside in Pittsburgh and that he would discharge his duties at the Pittsburgh office as well as at the general offices at Johnstown.

Mr. Donner became an active factor in the steel trade of the Pittsburgh district in connection with the organization of the Union Steel Company in 1900. He is a native of Columbus, Ind. In 1894 he organized the National Tin Plate Company, of Anderson, Ind., and was treasurer and manager. Afterwards he formed the National Tin Plate Company, of Monessen, Pa., the plant of this company being the starting point for the town of Monessen. Both the above companies were absorbed by the American Tin Plate Company in the latter part of 1898. Mr. Donner's next undertaking was the organization of the Union Steel Company, Pittsburgh, which built a wire plant and later open hearth steel works and blast furnaces at Donora, Pa., and he was instrumental in the building of that town. A consolidation of the Union Steel Company with the Sharon Steel Company, of South Sharon, Pa., now known as Farrell, came in 1902, and the consolidated company was taken over by the United States Steel Corporation in 1903.

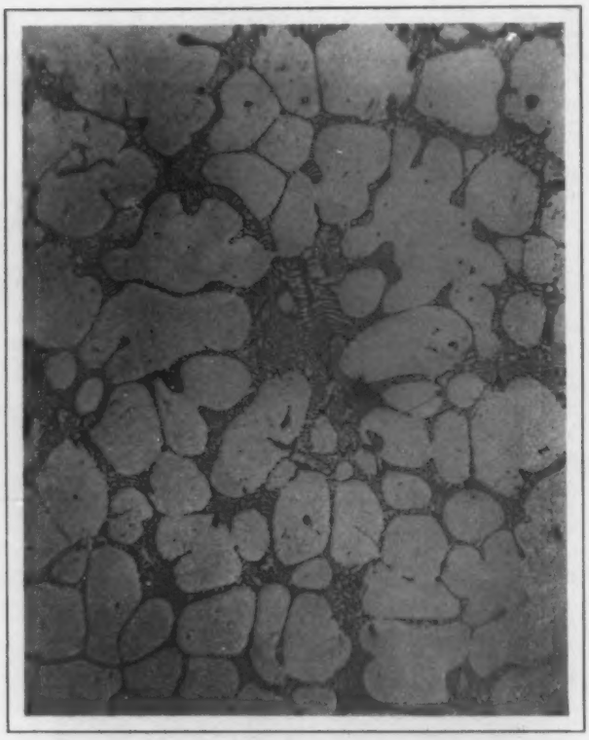
The Tonawanda Iron & Steel Company, North Tonawanda, N. Y., will blow in its B furnace early this month, and A furnace soon after.

The New Jersey Zinc Company blew in the second of its spiegel furnaces at Palmerton, Pa., September 9.

Slag Inclosures in Steel Ingots*

Questions of Distribution and Mechanical Suspension of the Impurities in Molten Steel—Promise of the Electric Furnace

As a preliminary step toward a complete study of the equilibria of iron and manganese sulphides, the author undertook several fusions of pure manganese sulphide. These fusions were carried out in a crucible prepared by boring out a rod of pure graphitic carbon, and this crucible was heated in a carbon-tube electric resistance furnace heated by an alternating current of from 300 to 400 amperes. The atmosphere in the tube furnace was kept neutral by passing through the tube a fairly rapid current of pure dry nitrogen, so that the only oxygen present was that derived from the air entangled in the fine manganese sulphide powder with which the crucible was charged. Thermo-electric measurements of the temperatures were not made in these preliminary experiments, but the temperature of the crucible was observed by means of an accurately calibrated optical pyrometer.



Fused Manganese Sulphide, Etched—Engraving About Three-eighths of the Size of the Original Photograph Taken at 380 Diameters

Melting Point of Manganese Sulphide

The condition of the contents of the crucible was ascertained by means of a thin carbon rod which passed through the carbon stopper which closed the upper end of the furnace tube. At first this rod rested upon the surface of the powder with which the crucible was filled, but at a well-marked temperature the rod sank down to the bottom of the crucible. On moving it about the contents of the crucible were then found to be somewhat viscous, but as the temperature rose further the resistance of the crucible contents to the movements of the rod became negligible, and observations with the optical pyrometer showed that this occurred consistently at a temperature close to 1320 deg. C. The temperature of the furnace was never carried beyond 1350 deg. C., and on allowing the apparatus to cool it was found that sensible resistance to the movement of the carbon rod in the crucible began at a temperature lying between 1320 and 1310 deg. C., while at the same time a decided diminution of the rate at which the temperature of the crucible fell was also observed.

These observations were repeated several times and appear to indicate with some certainty that the sulphide of manganese used in these experiments melts and freezes at a temperature not far removed from 1315 deg. C and that there is probably a heat-evolution near this temperature on cooling. There is, however, some reason to doubt whether the molten mass in this experiment was really pure MnS, since in spite of the care taken to render the conditions of heating as neutral as possible, there was a decided evolution of fumes from the furnace and for a short time there was a decided odor of sulphur dioxide. This suspicion that some chemical action had taken place to a small extent is supported by an examination of the micro-structure of the small ingot produced in this experiment. The micro-structure is shown in one of the illustrations, which shows light-colored polygonal grains or crystals embedded in a beautifully marked and very typical eutectic. The specimen photographed was etched for a short time in very dilute hydrochloric acid dissolved in alcohol and this action resulted in the decided blackening of the minor constituent of the eutectic, which had already been visible, although somewhat dimly, in the polished specimen before etching.

Since the bulk of the specimen in question consists of MnS, it is surprising to find that there is in the eutectic a constituent which etches more rapidly in a dilute acid than MnS, as it is evident on careful examination that the white and not the dark constituent of this eutectic is identical with the primary crystals of MnS. Whatever the exact nature and composition of this eutectic, however, it is obvious that the approximate determination of the melting and freezing temperatures of this substance must be affected by its presence to a considerable extent so that the true freezing point of pure MnS is certainly higher, and may even be very considerably higher than the tem-

Inclosure Leading to Crack in Laminated Spring, Which Failed in Service—From Photograph at 800 Diameters Reduced to Three-eighths Its Size

*From a paper by Walter Rosenhain, D.Sc., National Physical Laboratory, Teddington, England, presented before the International Congress for Testing Materials, New York, September 3, 1912, and forming the official report on problem 43 of the association.

perature which was found in the experiment in question. It seems unlikely, however, in view of the comparatively small proportion of the eutectic present, that the true melting point of the pure sulphide should be much higher than 1350 deg. C.

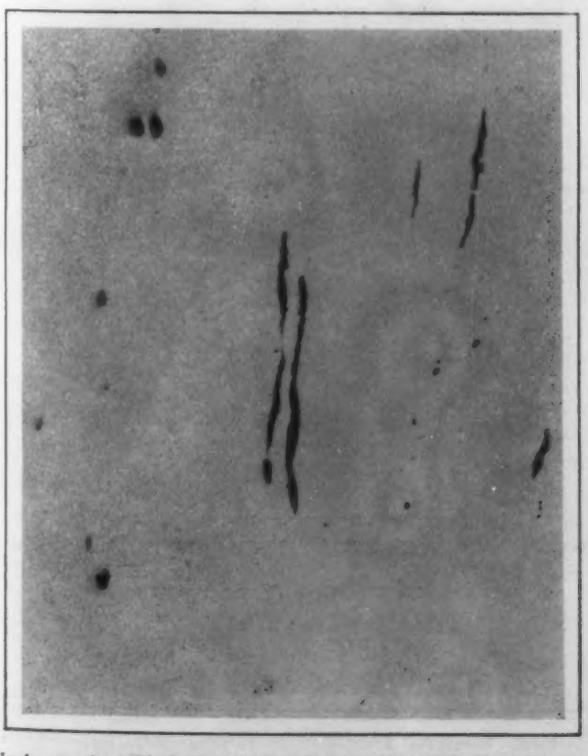
Mixed Solution of Iron and Manganese Sulphides

Levy's preliminary study of these equilibria has shown that MnS possesses the power of retaining FeS in solid solution up to close upon 50 per cent. This result is of importance in two respects; it indicates that even if the amount of manganese present in a steel is less than sufficient to take up all the sulphur, yet the manganese sulphide which is formed will be able to hold in solid solution very nearly its own weight of sulphide of iron. How far this mixed sulphide approximates in its properties and behavior to that of pure or nearly pure MnS yet remains to be determined; it may be that as regards the vital question of distribution in the steel such a solution of the two sulphides—which is probably more fusible than either sulphide alone—may behave more like FeS than like the decidedly less harmful Mns. On the other hand, from the analytical and micrographic point of view the existence of these mixed sulphides is of importance since it is likely to affect their behavior to reagents and their microscopic appearance as compared with that of pure manganese sulphide.

Are Inclosures All in Mechanical Suspension

An important question concerning the nature and constitution of the inclosures found in steel is that of their solubility or otherwise in hot or in molten steel. This question fundamentally affects our conceptions as to the origin of these bodies and their behavior during the freezing and subsequent cooling of the steel, and—most important of all—the means to be adopted for their elimination. If these substances are soluble in molten steel even to a small extent, then it is practically impossible to eliminate them entirely; on the other hand, it has been widely assumed—perhaps on insufficient data—that the sulphides and silicates are totally insoluble in molten steel and that their condition is purely one of mechanical suspension.

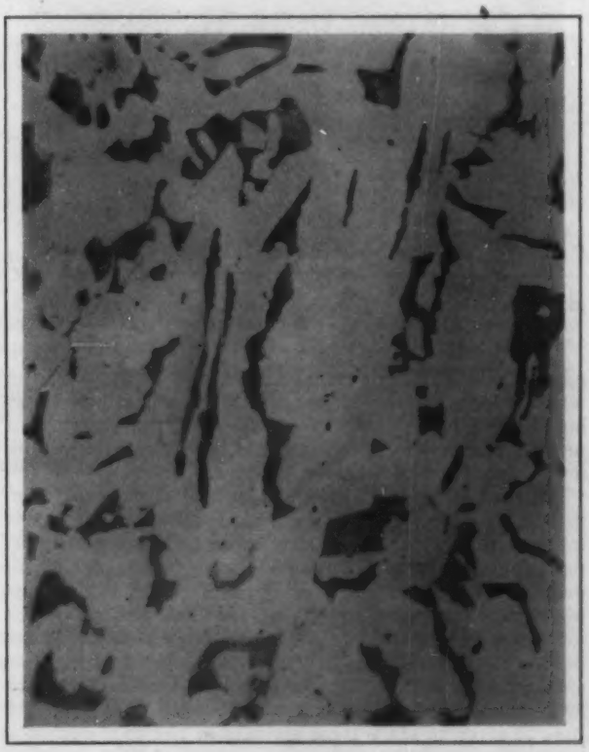
The possibility is certainly worthy of consideration whether there may not be a certain slight solubility of silicates and sulphides in molten iron and that this solubility may rise perceptibly with increasing temperature above the melting point. In that case, the enclosures would be separated from the molten steel during the cooling process which occurs prior to the actual filling of the molds. A part of the separated bodies would have time to rise to the surface and join the slag, but the remainder would be frozen in situ in the solidifying metal. It is evident also, that the question of such solubility at extremely high temperatures must materially affect the mode of action of the additions made to steel in the furnace or in the ladle; given such solubility everything would depend upon the temperature at which the additions were made and then on the temperature to which the steel was allowed to fall before the molds were filled.



Inclosures in a Shaft Fractured in Service, Unetched—From Photograph at 360 Diameters Reduced to Three-eighths Its Size

The Question of Solubility of Iron Oxide

An important question in this connection arises as to the solubility or otherwise of iron oxide in molten iron or steel. The presence of minute particles of oxide has been recognized under the microscope and their nature has been demonstrated by the reducing action of hydrogen, but



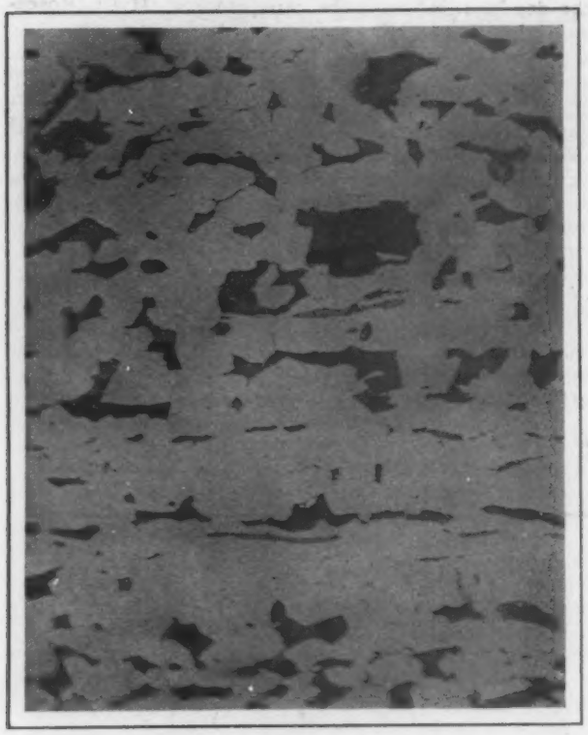
Inclosures in a Shaft Fractured in Service, Etched—From Photograph at 360 Diameters Reduced to Three-eighths Its Size

there is an important distinction in this matter between oxide which is present merely in suspension and oxide which has been separated from solution. In the case of copper the existence of solubility of the oxide in the molten metal is well established and the formation of a well-defined eutectic of copper and cuprous oxide has been demonstrated by Heyn. Ziegler speaks of such an eutectic in the case of iron and iron oxide as a matter of course, but gives no definite evidence of its existence.

Perhaps the only sound method of determining this important point is by a more accurate study of the freezing point of pure iron; if this freezing point is materially affected by the presence of oxide in contact with the molten metal then we are justified in concluding that there is a corresponding degree of solubility, but if the freezing point is not affected the probability of any sensible solubility is remote. The facts at present known do not afford the necessary data.

Knowledge on Formation of Inclosures Insufficient

From what has been said above, it would seem that our knowledge of the mode of formation of the inclosures met with in steel has not yet advanced far enough to make it possible to put forward definite rules for their more or less complete elimination. It is evident, however, that the two elements, oxygen and sulphur, are principally responsible for their presence in the finished steel, while the action of manganese tends to reduce the quantity of inclosures and to lessen their harmful nature. On the



Inclosures in a Mild Steel Bar—From Photograph at 950 Diameters Reduced to Three-eighths Its Size

other hand, it is evident that in steel-making processes which depend on oxidation of the carbon either by an air-blast or by the oxygen of the ores, the presence of oxygen cannot be entirely avoided, and this carries with it the formation of silicates.

Our knowledge of the sulphides and silicates of manganese, however, is now sufficiently advanced to enable us to state that in molten steel those bodies are probably present as liquid globules and in order to minimize the quantity of inclosures it is only necessary to adopt those methods which are known to aid the elimination of inclosed globules of foreign liquids from a much denser fluid. These conditions are that the globules in question shall be caused to coalesce in such a way as to form few large globules instead of very numerous small ones, and that time be given to allow these globules to rise to the surface.

Analogy to Mode of Handling Molten Glass

The latter condition appears to be chiefly a question of works economy, and it is likely to be more widely considered if the desirability of eliminating the inclosures is more fully recognized. The former condition is much more difficult to fulfill, and probably requires very careful investigation. We may, perhaps, consider the somewhat analogous problem of the rapid elimination of gas bubbles from molten glass; the time required for such bubbles to rise to the surface if the bubbles are small is excessively long, and very fine bubbles will never rise at all. The glassmaker avoids this difficulty by two methods; he adjusts his glass composition in such a way that very small bubbles are never formed, and secondly he assists the smaller bubbles to rise by causing the molten glass to "boil" by pushing into it some substance which gives off large volumes of gas—such as a wet potato.

It is possible that analogues to both methods might be applied to steel—the exact time and temperature at which additions are made may be found to influence the size of the resultant globules of manganese sulphide and silicate, while it may also be found possible to agitate the steel by some artificial means. It would seem that, at all events, there are possibilities of an advance in these directions which are worthy of consideration.

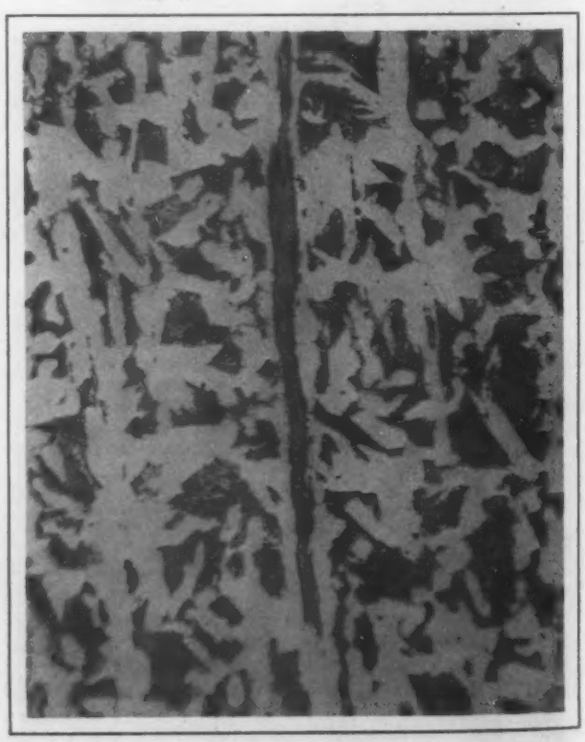
Distribution of the Inclosures in Steel

The distribution of the inclosures, which is obviously dependent upon their mode of origin, has been studied by both Hibbard and Ziegler. The former author calls attention to the fact that the importance of a given volume of inclosures depends upon their distribution—in the form of minute globules he considers that they are of minor importance, but in the form of thin films on the crystal junctions he regards them as dangerous even if present in quantities too small to be recognized with the microscope.

According to Ziegler—and the observations which he describes and quotes are very striking—these inclosures serve as nuclei or centers of crystallization upon which the alpha iron which, on further cooling, is separated from the austenite, begins to deposit. Just as we find the crystals of a saturated aqueous solution forming by preference upon any foreign bodies which may be suspended in the liquid, so we find the ferrite (or cementite) depositing upon these inclosures of "foreign" matter.

Ziegler has thus suggested a reasonable explanation for the fact that the ferrite in slightly hypo-eutectoid steels is principally located in the form of a network which represents the boundaries of the previously existing austenite crystals. Two difficulties, however, yet remain to be explained in a satisfactory manner. The first of these is the fact that when the austenite crystals are caused to increase in size by heating the steel to a higher temperature apparently the inclosures are pushed along into the boundaries of the larger crystals—since the prevalence of the inclosures in the ferrite network is not confined to any particular grain-size which the steel may possess. If the inclosures are forced into the interstices of the austenite crystals originally formed on solidification from fusion, it is not very easy to see how they can travel through the steel in order to remain in the boundaries of the austenite crystals through all the vicissitudes of mechanical and thermal treatment which the steel may undergo.

There are some considerations which may indicate that the inclosures are not in reality so mobile as might be imagined. Thus, although we usually find the inclosures in ferrite, it does not necessarily follow that the ferrite reticulation in which we find it corresponds with the last-formed set of ausenite boundaries; a tendency has in fact been observed for the recurrence, after heat-treatment, of the reticulation previously existing. Thus in the case of "burnt" steel Stead showed some time ago that networks of inclosures produced by burning persist after heat-treatment which has entirely broken up the previous ferrite reticulation. Again, we commonly find in commercial steel a banded arrangement of ferrite and pearlite, and although this is obviously traceable to the rolling process which



Inclosure Consisting Principally of Sulphide of Manganese in a Rail Fractured in Service—From Photograph at 500 Diameters Reduced to Three-eighths Its Size

the steel has undergone, the banded structure is extremely persistent in spite of repeated annealing.

Another example of the comparative immobility of inclosures is to be found in the long lines of "slag" or "cinder" to be seen in wrought iron. These are elongated by rolling, and persist in their elongated form through a very considerable amount of prolonged annealing.

Ascribing Defects Indiscriminately to Inclosures

There appears to be a growing consensus of opinion in the direction of regarding the presence of inclosures as seriously deleterious to the steel. One of the few exceptions to this statement is the expression of opinion by J. E. Stead, in the discussion at the Copenhagen Congress, that the presence of inclosures in comparatively small quantities was of no serious effect on the properties of the steel. On the other hand, L. Guillet and others quoted cases of extreme brittleness in steels due to the presence of inclosures.

The injurious effects of these bodies have since been discussed in some detail by Hibbard, by Ziegler and—in greater detail and with considerable experimental data—by Fay in his paper on "A Microscopic Investigation of Broken Steel Rails: Manganese Sulphide as a Source of Danger." In this paper, Fay shows the manner in which cracks are originated in the inclosures, by breaking previously polished specimens in such a way that the course of the crack can be traced. To the cases cited by Fay, a large number of others may be added, such as those quoted by Oberhoffer, Primose and a number which have come under the notice of the present author. As an example of the latter, the case illustrated of a crack found in a railway axle which had broken in service may be given. The manner in which this crack follows the path of minute inclosures is very striking. Another striking example from the author's own practice is the case of a laminated railway spring which failed in service, and on examination was found to be seriously cracked in the vicinity of numerous large inclosures. A photo-micrograph of some of these inclosures is also given. The cracks in this case were evidently formed during hardening, and the danger arising from the presence of inclosures in steel which is to be quenched is thereby illustrated.

While there is thus ample evidence to justify the view that inclosures are harmful to steel and may in certain circumstances become dangerous defects, there is some need for caution in ascribing actual failures to the presence of inclosures in every case where the latter are met with in the broken object. In all commercial steel derived from either the Bessemer or the open-hearth processes, inclosures are present in greater or less degree, and it is easy simply to ascribe to them every case of failure met with. There are, however, other causes of brittleness in steel—such as those recently studied by Humfrey and where it is found that the brittleness of the steel is intercrystalline—i.e., where the fractures run along the crystal boundaries and not through the crystals—such other causes should be carefully looked for. From Ziegler's work we know that the inclosures are embedded, as nuclei, within the crystals of alpha iron in the steel, so that fractures running along the boundaries of the alpha iron crystals can hardly be ascribed to the presence of these bodies.

The Discussion

E. H. Saniter, metallurgist, Steel, Peech & Tozer, Sheffield, England: If you get an inclosure from a wild steel, that is, a steel full of gas and boiling up, if you get an inclosure from the center of one of those ingots, you will find it is mainly oxide of iron, with a little manganese oxide, because the steel is low in manganese and low in sulphide. If you get a steel with a good deal of silicon in, and where the steel is dead, you will find that the inclosure in the center of the ingot is a double silicate of manganese and iron, and also contains sulphides, probably of manganese, but that I cannot say—it may be sulphide of iron. If you have used aluminum to kel that steel, you will find there is a good deal of alumina also in the central inclosure.

Another point which interests me very much was the additional information which Dr. Rosenhain has given us with reference to the eutectic of calcium and manganese sulphide. The question of desulphurizing has always interested me very much, and it occurs to me that this discovery of Dr. Rosenhain may lead to clearing up the theory of the desulphurization in the basic process. If Dr. Rosenhain could find the time to investigate what was happening when he had an excess of calcium sulphide in his mixture, and also the other case where he added calcium sulphide and manganese sulphide to caustic lime in his mixture, it might probably be very valuable information as regards the theory of desulphurization in the basic process.

The Electric Furnace for Giving Steel a Dead Melt

Prof. Joseph W. Richards, Lehigh University: The question of getting rid of the slag inclosures, I think, is largely a question of allowing the steel to rest. Take the analogy of oil and water. As long as you stir up the oil and water together, you will get the imperfect separation. We can rest steel and other metals in practically three ways: You can rest it in the ladle, an old device known to every one, and let it stand in the ladle as long as possible before casting. That is only an imperfect solution of this problem. The second is to put the steel into a crucible and hold it melted, and get it to a dead melt. That is, however, for practical purposes out of the question for a mass of steel, and the third solution, and the one which is going to be practicable, is to keep the steel melted in an electric furnace, so as to give it a dead melt. The cost of doing that is going to be between 25 cents and 50 cents a ton for holding the steel melted from one-half hour to an hour, keeping it quiet and giving it a chance to rest. The steel itself is like an emulsion, like muddy water; it needs to settle, and as far as I know, gravity is the agent for effecting the separation. I think that it is not saying too much to say that all good quality steel in the near future will be put through an electric furnace.

Capt. Robert W. Hunt: It happens that one of our very largest manufacturers has experimented with the dead melting of rail steel in the electric furnace, to the extent of producing, if I mistake not, something like 5,000 tons of finished rails. These rails went through the service of last winter which, in this country, was of particularly severe character, and, so far as I am informed, not one of these electric furnace rails broke, while an appalling number of rails made by various other processes, both Bessemer and basic open-hearth, failed under like conditions.

The Normameter for Testing Hardness

In Revue de Metallurgie for July there is a description of a new machine for testing hardness and an account of some experiments. The writer is M. V. Bernard. The machine is simple and is shown in the cut. It is similar in principle to the scleroscope except that the blow is given by a little hammer furnished with a hardened point. This hammer swings like a pendulum and the height of the rebound after falling a certain distance measures the hardness of the specimen subjected to the blow. The little machine does not need a detailed description. The sample is held tight in a vise and the hammer is caused to strike its surface normally.

The Normameter

M. Bernard carried out many experiments and found that the results obtained only appeared sufficient for coarse approximations of the hardness of the different steels tested. Various factors that were tested, such as the length of the bar, the orientation of the machine, the state of surface of the specimen, were without influence on the results within the rather wide limits tested, possibly because of the reduced sensitiveness of the apparatus. G. B. W.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, announces some changes in its differentials between gauges of galvanized sheets. The new basis makes advances of 5c. per 100 lb. on No. 29 and on Nos. 22 to 24. The 11½ oz., which is the same as No. 29 gauge, will hereafter be sold as No. 29 at the differential of 15c. per 100 lb. over No. 28.

Railroad Scrap Reclaiming Rolls

A New Type of Light Rolling Mill Recently Developed by the Ajax Mfg. Company

Railroads are prolific producers of scrap which finds a market through dealers or is sold direct to consumers. If the railroads could reclaim this scrap by rerolling and convert it into new material suitable for their use at a moderate cost a great saving would be effected; hence, a process or machinery devised to do this economically attracts interest among railroad managers. For several years the Ajax Mfg. Company, Cleveland, Ohio, has been experimenting on a reclaiming roll for this purpose and has finally developed a machine with which the rerolling of scrap can be done economically. This machine has been given a thorough test in the shops of several large railroad systems in various parts of the country and is said to be fully proving the earning capacity claimed for it.

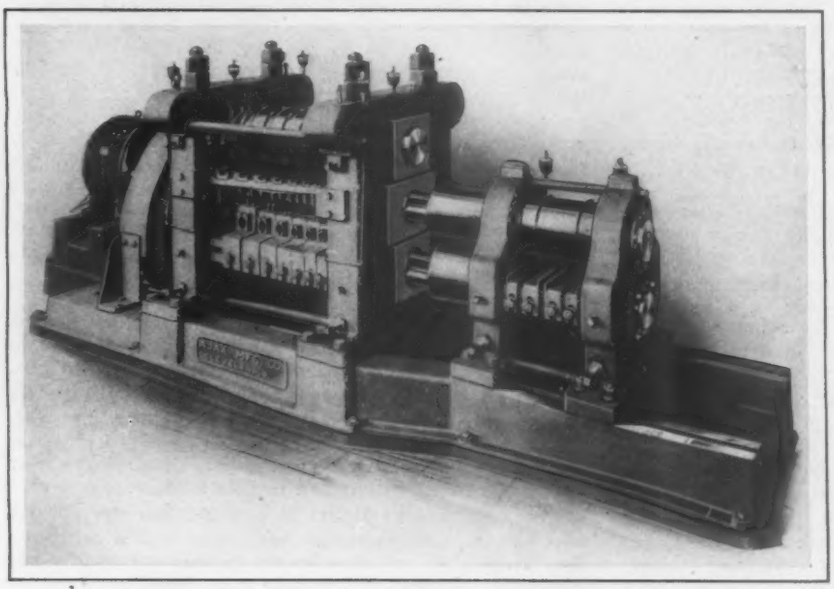


Fig. 1—A New Machine for Reclaiming Railroad Scrap Built by the Ajax Mfg. Company, Cleveland, Ohio

The Ajax reclaiming roll, which is a late development in light rolling mill design, is designed for producing round, square or flat iron or steel bars. The scrap is simply heated and rerolled to the size desired. Scrap truss rods, arch and drawbars, center pins, etc., of which the aggregate tonnage is heavy, and which have heretofore been sold at scrap prices, can be rerolled into round stock from which bolts can be made and into flat bars for use in making car fittings. The machine is a mill of the three-high roll type with full adjustments. It has an auxiliary or second set of rolls for splitting flat stock longitudinally, preparatory to rerolling it on the main reducing rolls. The rolls, which are grooved, are made in several sizes, the standard machine having a capacity for reducing 2-in. rounds down to from 1¾ to ½ in., inclusive, or corresponding sizes of flats and squares, the range of the main rolls for reducing flats depending upon the nature of the flat scrap that is being used. The scrap bars are ordinarily cut in lengths varying from 2 to 5 ft., depending on the section. The larger the bar the shorter is the length to which it is cut.

Fig. 1 shows the front of the machine and also the auxiliary set of splitting rolls. The larger pair of roll housings carries the main reducing rolls and the smaller pair the splitting rolls. Both housings are very massive in construction. The yokes over the main housings insure ample strength and rigidity. The smaller housings are continuous and are seated on T ways so that the splitting rolls can be easily removed. The base plate for the four housings is cast in one piece. Fig. 2 illustrates a set of three main reducing rolls for rounds and the pair of splitting rolls with a crab connection that joins them. The purpose of the splitting rolls is to shear lengthwise such flat stock as drawbar yokes and arch bars and thus convert them in convenient shape for rerolling into rounds, squares or flats. Both the main and splitting rolls are forged from steel of special analysis best suited for the work of rolling from hot metal. Each set of rolls is carried in phosphor bronze bushings. The full adjustment of the machine permits the regrooving of the rolls.

The three main reducing rolls are 12 in. in diameter and 40 in. long between the housings. Two sets of main rolls are furnished, one set for rounds and another set for either flats or squares, as may be specified. The splitting rolls are 11 in. in diameter and 20 in. long. The main rolls have solid sleeve bearings which are arranged for vertical adjustment by double wedges. Each of these bearings can be easily removed by an overhead hoist after disconnecting the splitting rolls by sliding back the crab connection. The main housings have bronze adjusting eyelets which permit a lateral movement and insure the perfect alignment of the main rolls. These bronze eyelets are slightly tapered and by moving them in or out the rolls are adjusted laterally.

A complete set of in-and-out guides is furnished for the main reducing rolls and another set for the splitting rolls, thus making the operation of feeding the stock into the rolls the same as in regular rolling mill practice. The in-guides direct the stock into the grooves of the rolls and the out-guides, on the opposite side, lead the stock out and away from the rolls. Fig. 3 shows the in-and-out guides for round stock. In rerolling flats the scrap bar is first passed flatwise between the upper and middle rolls and is returned edgewise between the bottom and middle rolls, the operation being repeated until the stock is reduced to the desired size. In rerolling round stock the first pass is through the in-guide between the upper and middle roll, the bar coming out in an elliptical shape. It is then returned between the bottom and middle rolls and comes out round, the process being repeated until the stock is reduced to the desired size. The guides are arranged on a cross bar and are adjustable to the roll grooves. A cooling and straightening table should be located back of the machine upon which the bars can be placed as they come from the final pass of the rolls. After being straightened and allowed to cool they are carried to a storage pile.

The machine is either belt driven from a line shaft or directly connected to a motor, a 50-hp. motor having an approximate speed of 750 r.p.m. being recommended. The peripheral speed of the main rolls is approximately 300 ft. per min. The ratio of the gears from the main or flywheel shaft to the rolls is 5 to 1 and from the motor pinion to the gear about 3 to 1, making the total ratio about 15 to 1. All the gears and pinions have cut teeth. The machine weighs 45,000 lb., is 8 ft. high and occupies a floor space of 17 x 8 ft.

Ample heating capacity should be provided for heating the scrap stock. It is recommended that there be two furnaces, one with a heating chamber for bars up to 4 ft. long and the other for bars up to 8 ft. long. These furnaces should be set in front of and at right angles to the rolls about 6 ft. to the side of the front line.

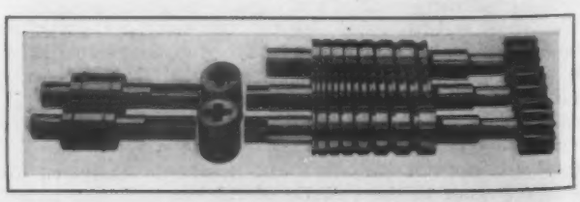


Fig. 2—The Main Reducing Rolls for Rounds, the Splitting Rolls and Crab Connection.

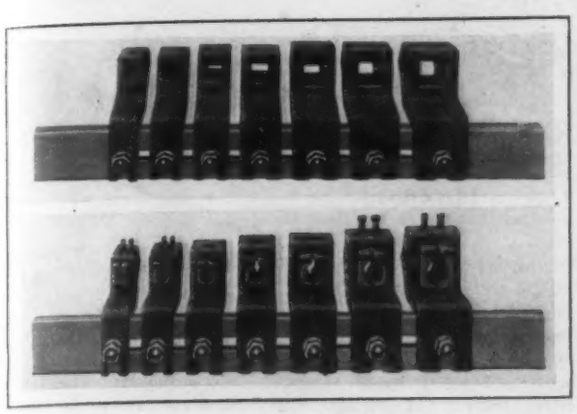
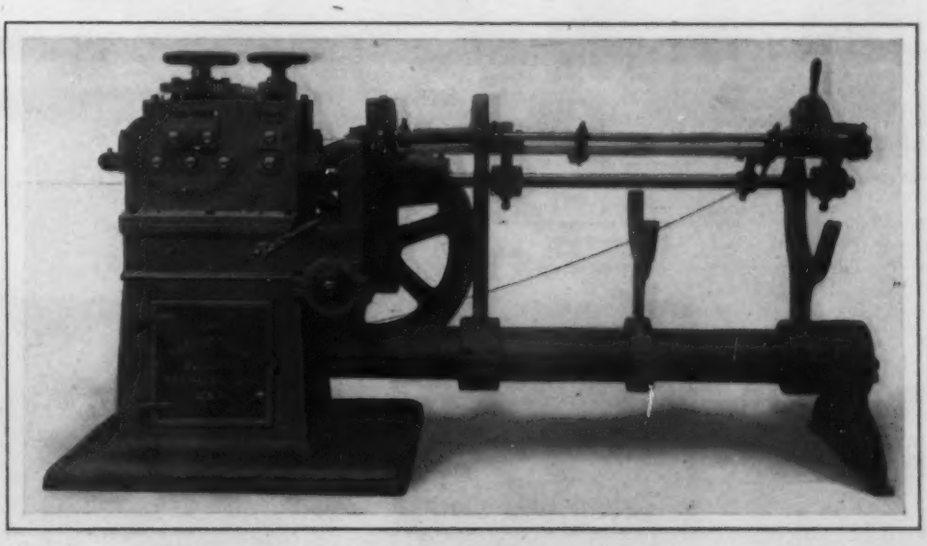


Fig. 3—The In-and-Out Guides

The capacity of the machine varies according to the nature and size of the scrap bars to be rolled and the size to which the bars are rerolled. It is stated that the average production ranges from 6 to 8 tons per day of 10 hr. and that the average daily fuel cost is about $6. For its operation the machinery requires a crew of four or five men. A complete crew consists of a roller, an assistant roller, a heater, a helper and a man to carry the rerolled bars to the cooling and straightening table.

Straightening Machine for Metal Strips

The F. B. Shuster Company, New Haven, Conn., has recently designed and built a larger size of strip metal straightening and cutting machine than the one which was illustrated in *The Iron Age*, October 6, 1910. Prior to the development of this new machine the maximum width of sheet metal which could be handled was 2 in., but at the present time this figure has been almost doubled, the greatest width now being 3⅛ in. The machine is designed to take the metal which may be brass, copper, steel, iron, etc., from the coil and straighten and cut it to accurate lengths. The maximum thickness of metal handled is ⅛ in. and the machine can be built to cut to any reasonable length, the one illustrated being arranged to cut lengths of 4 ft. and shorter.



The No. 3 Automatic Strip Metal Straightening and Cutting Machine Built by the F. B. Shuster Company, New Haven, Conn.

As will be noticed from the engraving, the machine consists of a substantial bed on which is mounted a housing containing five straightening rolls and a pair of feed rolls, these being placed on shafts in the center of the housing instead of outside as was the case in the smaller sizes formerly built. All of these rolls are geared and the upper ones are adjustable by the handwheels shown on the top of the machine to suit the shape and temper of the stock going through the machine. These adjustments can be made while the machine is in operation. Various guides are placed at the rear of the machine to take care of the different widths and thicknesses of metal within its range.

A special feature of the machine is the incorporation of a mechanism that stops the feeding of the material while the cutting is being done. The extension supplied is similar to that furnished on the company's straightening and cutting machine for round, square and hexagon stock, an illustrated description of which appeared in *The Iron Age*, April 4, 1912, with the exception that the guide bar is especially designed and grooved for handling flat strip metal.

In operating the machine the metal is placed on a reel at the rear of the machine, passes through the guides and from there into the straightening and feed rolls which carry it past the stationary die and the cutters. It then enters into the groove in the guide bar and passes along until it strikes the gauge which has been previously set for the length to be cut. This throws the feed releasing mechanism into operation, causing the feed to stop and the cutters to act and sever the metal. At the same time the cover of the guide bar is thrown off and the severed piece drops into brackets underneath which are provided to receive it.

The Kissel Motor Car Company's Expansion

The Kissel Motor Car Company, Hartford, Wis., is greatly increasing its productive capacity. It has bought, for the enlargement of its business, a plant in Milwaukee on the corner of Center and Thirty-second streets, which is modern, completely equipped and contains about 200,000 sq. ft. of working floor space, formerly occupied by the Romadka Trunk Company. The Kissel Company will take possession at once and expects to have the new plant in operation early in November. The plant is stated to be ideally designed for the company's needs and it is quite possible to turn out there 10,000 cars a year. At present it will be used only for assembling purposes, the manufacture of parts being continued at Hartford exclusively. The general offices of the company will be moved to Milwaukee.

The Kissel Motor Car Company recently added two commodious buildings to its plant at Hartford, figuring that the additional facilities thus provided would enable a less nerve-racking production schedule than that of last year. It appears, however, that the demand for Kissel-Kars has outgrown the factory growth, for double the early orders of 1912 have been booked for 1913. The rapid expansion in the growth of the company has brought it into decided prominence. Inside of six years it has risen from a $50,000 corporation into a $1,000,000 concern, with a surplus of $500,000 and subsidiaries in 10 States, each operating on additional capital. The entire stock is owned by the Kissel family, George A. Kissel being president and general manager and William L. Kissel secretary and treasurer. The latest move of the company had been in contemplation for some time and a number of cities put in flattering bids offering big bonuses for the location of the auxiliary plant. Milwaukee was chosen because of its nearness to Hartford and of the further fact that it offered buildings practically ready for occupancy.

Smoke abatement will be discussed at a meeting of the American Society of Mechanical Engineers, Tuesday evening, October 8, at 29 West Thirty-ninth street, New York. George H. Perkins, head of the engineering department of the Lowell Textile School, who attended the International Smoke Abatement Exhibition and Conference in London in March, is to introduce the subject.

Sound Steel—Segregation Research

Noteworthy Papers Presented to the Iron and Steel Institute by Sir Robert A. Hadfield

Sir Robert A. Hadfield, past president of the Iron and Steel Institute, presented two noteworthy papers at the meeting of that society in London on September 30. One of these is entitled "Method of Producing Sound Ingots" and the other "A New Method of Revealing Segregation in Steel Ingots." The first paper is an elaboration of the author's description of his patented method of producing sound steel, which was described in *The Iron Age* of February 1, 1912. At that time illustrations were given of the method of carrying out his process, with photographic reproductions of ingots as thus treated, showing the metal to be absolutely free from any indication of piping or segregation.

We have received from Sir Robert an additional photograph to those reproduced in his paper, which is given in the accompanying engraving. This photograph, presenting Figs. 1 to 5, shows billets rolled by Hadfield's Steel Foundry Company, Ltd., Sheffield, from an ingot made under the Hadfield American patents (Nos. 933,751 and 954,183) and other pending patents and illustrates the application of this method of making ingots sound and free from segregation. Sir Robert says: "It will be

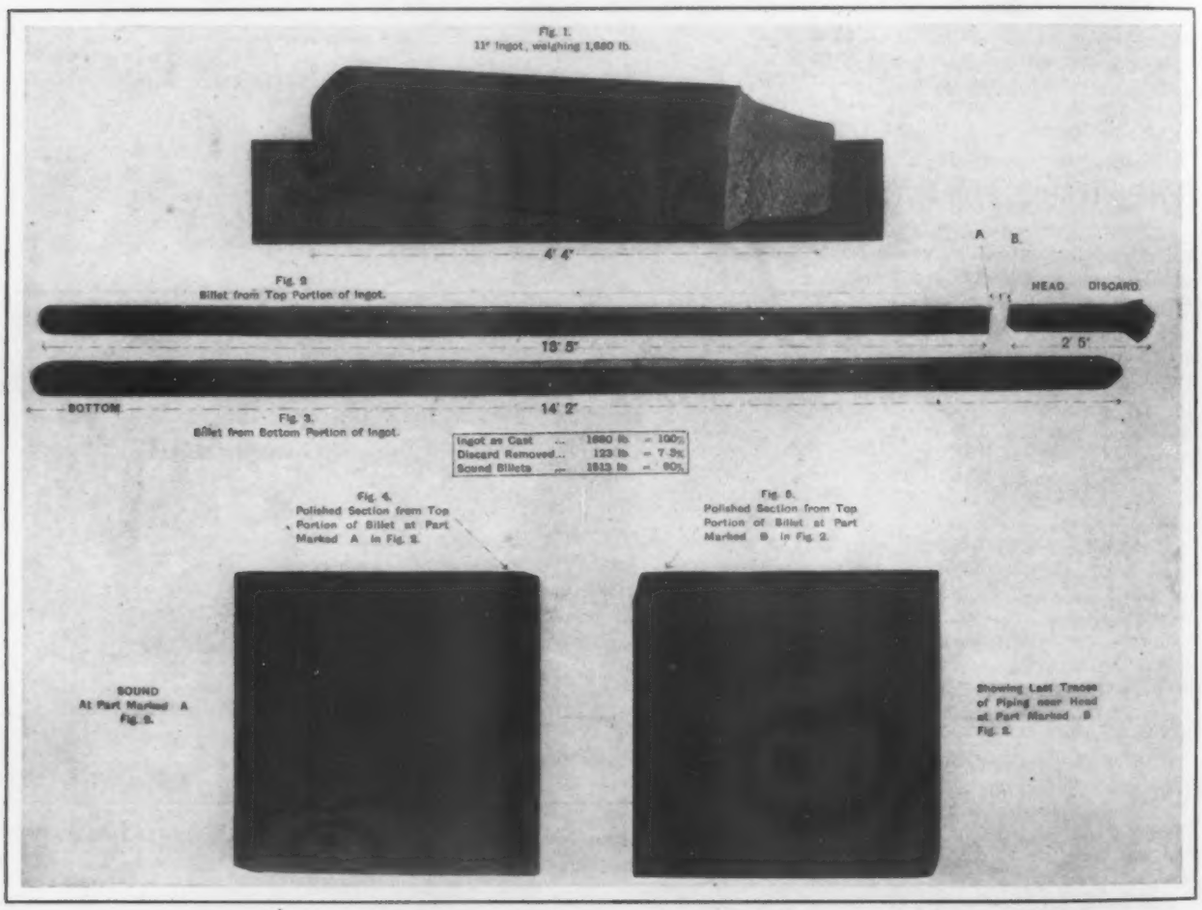


Fig. 1.
11" Ingot, weighing 1,680 lb.
4' 4"
A
B
Fig. 2
Billet from Top Portion of Ingot.
HEAD
DISCARD
13' 5"
2' 5"
BOTTOM
14' 2"
Fig. 3.
Billet from Bottom Portion of Ingot.
Ingot as Cast ... 1680 lb. = 100%
Discard Removed... 123 lb. = 7.3%
Sound Billets ... 1513 lb. = 90%
Fig. 4.
Polished Section from Top Portion of Billet at Part Marked A in Fig. 2.
Fig. 5.
Polished Section from Top Portion of Billet at Part Marked B in Fig. 2.
SOUND
At Part Marked A
Fig. 4.
Showing Last Traces of Piping near Head at Part Marked B
Fig. 5.

Figs. 1 to 5—An Ingot Made Under the Hadfield Patents for Making Sound Steel and Billets Rolled from the Ingot

their freedom from blow holes and piping. The Hadfield method consists in "heating the metal in the upper part of the ingot mold and maintaining it in a liquid condition by the combustion in contact therewith, or in close proximity thereto, during the cooling and shrinkage of the metal in the lower part of the mold, of solid fuel—for example, charcoal—by means of a blast of compressed air which is caused to impinge on the fuel while the fuel is directly or indirectly supported by the metal below; also the interposition of a layer of fusible material, such as iron slag, which has no injurious action on the metal, between the metal and the fuel."

The paper read before the Iron and Steel Institute, in addition to giving illustrations of an ingot mold receiving this treatment, presents a large number of photographic reproductions of machined sections of the resulting ingots, showing their freedom from piping and segregation, together with prints of rails rolled from such ingots. The photographs of polished sections show noticed that, allowing for all discard, reheating and oxidation losses, 90 per cent. of perfectly sound billet for rails can be obtained from the ingot. Fig. 4 shows the soundness of the billet at the part marked A, and the last trace of unsoundness being removed by 1 in. of discard from the billet is shown in Fig. 2 at A and B. It need hardly be said that this is not a specially selected case, but represents the average practice from thousands of tons of billets rolled and forged from ingots made in this manner."

The second paper, entitled "A New Method of Revealing Segregation in Steel Ingots," the author suggests should be considered with and as bearing upon the subject of his paper on "Methods of Producing Sound Ingots." He says: "The reason for this is that the research now described appears to offer the means of throwing light upon the complex problems met with in relation to the production of sound steel by methods in which segregation and piping troubles, if not entirely

absent, are largely reduced. In sound steel, which pipes unless steps are taken to deal with the troubles which accompany such piping, the difficulties of segregation in ingots which are not properly fed have not perhaps altogether been appreciated, as will be seen from the experiments now described." His paper, almost in full, is as follows:

A New Method of Revealing Segregation in Steel Ingots

While knowledge has long been sought as to the changes which take place in the interior of masses of steel during cooling down from the molten to the solid state, few experiments of a definite nature have been undertaken. This has been the more unfortunate because steel of any nature or type, while so cooling down, is subject to the development of defects of a somewhat serious character. These chiefly come under the terms "segregation" or "segregated areas," and are largely due to the fact that the two chief deleterious elements, sulphur and phosphorus, always present in steel to a greater or less extent, liquate and separate out from the mass in those portions of the ingot or casting which remain fluid for the longest period of time during the cooling down to the solid condition. Carbon and manganese, also to some extent nickel and chromium, also liquate, but they are not directly harmful in the same way as the two elements mentioned.

In other words, it is well known that at a certain stage of the cooling-down process of molten steel the complex phenomenon of liquation is met with and causes much difficulty. Possibly this phenomenon is more marked in its harmful characteristics in iron and its combinations known as steel than in any other metallurgical product. This is no doubt to some extent due to the high temperature necessarily employed during the manufacture of steel, which varies from probably about 1400° C. in alloy steel, such as the manganese steel, to about 1650° C. in molten steel of mild quality. This difficulty is intensified because of the peculiar behavior of the elements present. While sulphur and phosphorus give the most trouble, the above remarks also apply to the element carbon and the metal manganese alloyed with iron, and, as above mentioned, to a less extent as regards nickel and chromium. This segregation of the elements referred to gives a brittle, impure, and weak steel, which in the finished article may prove not merely objectionable but dangerous.

Segregation Begins When Steel Cools

There is no proof that segregation occurs in fluid steel itself; that is, all the elements are then well fused and not segregated. The difficulty begins as soon as the mass commences to cool down; in other words, segregation appears to be a function of the lowering of the temperature. Whether this arises owing in some way to the lowering of the tension of combination of the molecules, if one can use this term, is not certain. In any case, however, the difficulty experienced seems to be almost entirely confined to the steel remaining liquid to the latest stage, probably partly through want of ferro-static pressure occurring in the center of the mass. Thus, a steel of otherwise suitable composition—that is, sufficiently low in the deleterious elements sulphur and phosphorus—when cooled down will show, upon analysis, an increase of these elements at the segregated areas in some cases amounting to seven or eight times the original percentage. A sample of steel taken while fluid from the upper portion of an ingot is equally as pure as the lower portion. The difficulty only arises on cooling down, and in that portion of the ingot or casting where the ferro-static pressure is lowest.

Such segregated area if not removed remains in the casting, and becomes drawn out during the forging or rolling, or while being otherwise manipulated; thus seriously weak places mechanically will occur in the finished article. In some cases these defects get removed; for example, gun ingots are cast solid and are afterward usually bored out to remove the segregated areas. But this cannot be done in forgings requiring a solid section, so that the center of disturbance remains present in such areas, in some cases giving rise to the production of articles possessing serious internal weakness which may break, if not at once, later on in service. This has, for example, been noticed in the case of rails, and dangerous accidents have resulted through their breakage.

The author thought that if it was possible to find means of ascertaining how this segregation arises, useful information would be obtained and methods of investigation opened up by which the difficulty could be dealt with and overcome. He therefore presents the results of this research and the methods adopted, which to his knowledge have not before been tried. They are simple, and yet by their use afford considerable information in the desired direction; that is, they show, to some extent, what is going on inside the molten mass during the cooling portion of the process.

Copper Added to Steel to Show Segregation

The research commenced in this manner. It was reasoned that possibly some addition, preferably metallic, could be made to steel while in its molten or partly fluid condition which would give the desired effect. Thus, upon breaking up the ingot when cold, if it would show the presence of the added metal in some clear and definite manner, such as by difference in color, useful information would be obtained. The author, therefore, after a considerable number of experiments with various metals, selected copper, which, by its slightly higher specific gravity as compared with iron, would have a tendency to fall or drop down the central portion of the ingot being experimented upon; moreover, by its distinctive color at the parts where it is alloyed with the iron its presence would be apparent.

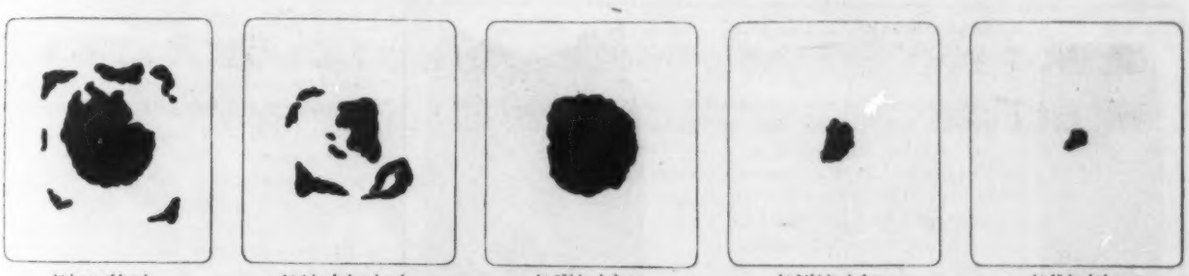


Fig. 6—The Penetration of Copper in an Ingot 2½ In. Square and 30 In. Long

In the first instance (Experiment No. 5893), a small ingot, 2½ in. square and about 30 in. in length, was poured into an ingot mold in the ordinary way. The composition was as follows: Carbon, 0.41 per cent.; silicon, 0.53, and manganese, 1.32.

This ingot was furnished with a sand head, the object of the sand head being to feed the shrinkage taking place in the remaining portion of the ingot. In other words, the ingot mold itself being of cast iron and the ingot head of sand, the molten metal in the latter remains fluid for a much longer time and helps to feed the shrinkage or contraction of the remaining portion of the ingot when it cools down to the solid condition.

The First Experiment With Copper

Soon after the small 2½-in. ingot was cast, a few ounces of molten copper was poured into the center of the hollow space remaining in the sand head, about 1½ in. from the outside. The time which elapsed between the casting of the ingot and the pouring of the copper into the hollow space was approximately 30 seconds. In this case, the result of pouring the molten copper, which was added in a comparatively cool condition—that is, it was not as hot or fluid as it should have been—appeared to be to chill the upper portion in the sand head. At first it was thought the copper had not penetrated the molten steel of the ingot at all. However, on breaking off the ingot

head and making a longitudinal fracture it was discovered that the copper had forced its way through a hole in the center of the ingot of very small diameter, and penetrated nearly the *full length* of the ingot—an interesting result and somewhat unexpected. Fig. 6 shows the appearance of the ingot when it was broken up under the hammer. The cuprous areas are indicated in black as they appeared in the fractures of the material.

The copper had penetrated into those portions of the ingot where piping usually takes place, and thus indicated the exact location where what may be termed inter-crystalline unsoundness or segregation is developed. It may be mentioned that this particular type of inter-crystalline unsoundness is not usually seen or detected in the fracture of an ordinary ingot when cold; it is only revealed by a polished section after etching. The cuprous areas in these small ingots probably represent these segregation areas.

Results of Subsequent Experiments

This experiment showing interesting promise, the research was continued on several ingots 6 in. square, each about 3½ ft. in length, and weighing about 4 cwt. The design of these was similar to the small ingot just referred to; that is, the ingot itself was cast in an iron mold with the head portion of sand.

Into the head of the first 6-in. ingot No. 7455/1978A, 15 lb. of fluid copper, previously melted in a plumbago crucible, was poured half a minute after casting. The addition of the copper was carried out somewhat earlier than at first intended, because in the previous experiment on the ingot of small size the copper appeared to cause the steel in the head of the ingot to set. In the case, however, heat No. 7501/1978A. In this case 15 lb. of molten copper was added after a period of 3½ min. had elapsed after casting. This steel settled well in the sand test, also in a 2½-in. ingot made at the same time, but the larger ingot was not quite sound. This was not, however, in any way due to the added copper, but to the interior of the mold being slightly damp. The experiment was repeated on a perfectly sound ingot and the results were the same. It was thought, therefore, interesting to present the unsound ingot to show that the same law applied to unsound as to sound steel. The dark areas in Fig. 7 show the cuprous portions of the first ingot. These portions are indications of the state in which the interior portion of the ingot existed 3½ min. after casting. After such a comparatively long interval of time, and in such a small ingot, it is somewhat remarkable that the copper should have descended so deeply. If the copper is added too early, that is, before the steel solidifies, it displaces or penetrates the molten material remaining. If the copper is added when solidification is completed, then it does nothing more than fill up the cavities or strengthen segregation areas which are not really mechanically solid.

The Author's Conclusions

It would appear from these experiments that a valuable source of information is opened up for making tests with regard to rates of cooling, segregation and liquation. Moreover, these results show that the interior of an ingot, even of small size (and it will be therefore more so in a large ingot), remains hotter for a much longer period than has been thought to be the case. It can, therefore, be more readily understood why segregation proves so harmful, for, owing to this longer time of cooling and the reduction in the ferrostatic pressure, naturally much greater opportunity occurs for the liquation of such harmful elements, sulphur and phosphorus. The more quickly the steel sets, the less opportunity is therefore given for this segregation. This fact has long been known in a practical way, but the reason for it has not been so apparent. The results of the present experiments seem to clearly indicate why quick cooling is advantageous. The following are comments upon the various figures:

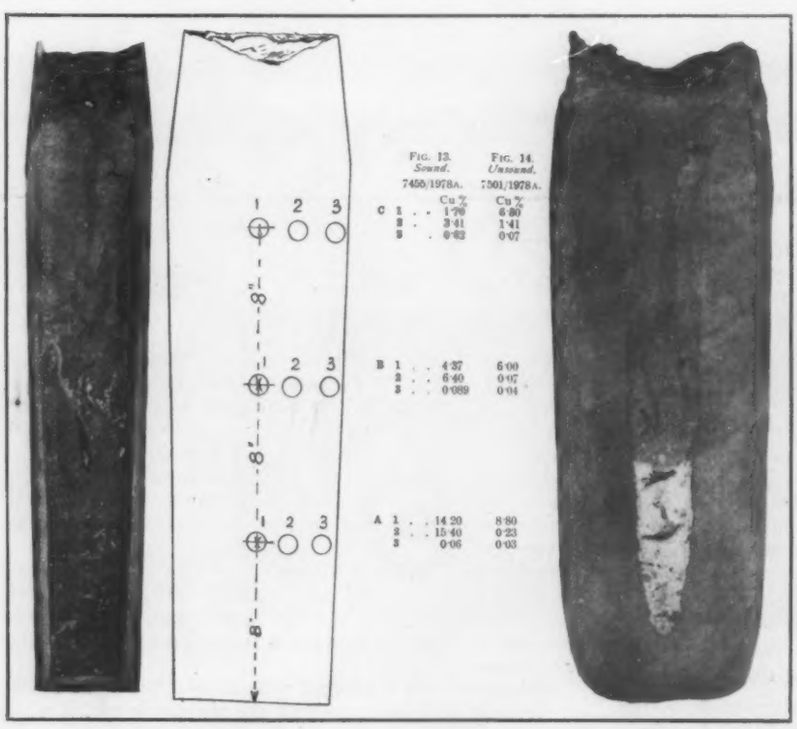


Fig. 7 Fig. 8 Fig. 9

In Fig. 8 are shown the percentages of the copper found at the respective portions of the ingots Nos. 7455/-1978A and 7501/1978A, as marked, described earlier in the paper. Fig. 9 shows a larger ingot of about 14 in. diameter, into the head of which about 28 lb. of molten copper was poured 15 min. after casting. The head was then covered with charcoal and was not afterward disturbed. The ingot was allowed to remain in its mold for one hour. The material was annealed and a section prepared, sulphur printed and etched. The copper was found to have penetrated to within about 9 in. of the bottom, as will be seen, thus showing that even 15 min. after casting the ingot was fluid at this point and was readily permeated by the copper.

The examination of the sulphur print showed that there appeared to be some segregation at the bottom of the cuprous area. The cuprous portion could be picked out by the somewhat different appearance to the rest of the section.

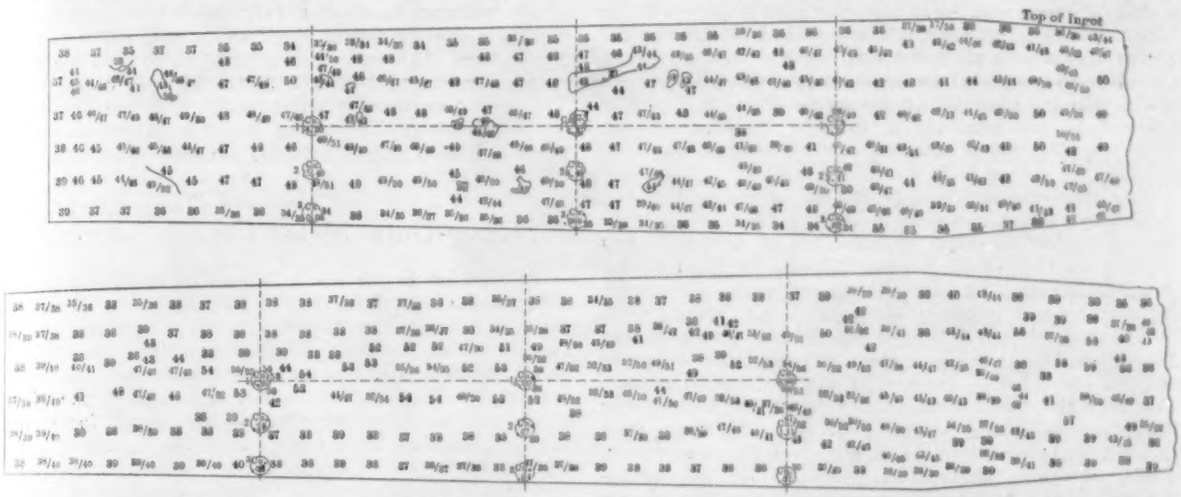
Figs. 10 and 11 give the results of scleroscopic tests on two ingots, and also show the percentages of copper present at different portions.

Probably what has occurred in the ingots described is that upon adding the copper which is poured on the top of the ingot a pipe is formed, and the copper is forced into this by pressure. As the ingot cools down more pipe is formed; the copper still remains fluid and keeps such pipe portion filled. As, however, the copper contracts more than the steel, the cavity formed by piping draws

of the 6-in. ingot, the copper did not cause the steel in the head to set as expected; most of it descended by its superior gravity almost bodily to the lower portion of the ingot. This ingot was parted into two portions so as to give a central longitudinal section; the section was then etched. Fig. 7 shows the appearance of the first ingot, the dark portions being those colored by the added copper. From the results obtained it will be noticed that half a minute after casting the ingot appears to have set to a thickness of about ⅝ in. to ⅞ in. along the sides and ⅞ in. on the bottom. In the cuprous areas will be noticed crystals which have the same appearance as the outside envelope.

As in this 6-in. ingot the copper was found to have been added somewhat too soon to give a full indication of what occurred on the steel reaching its setting or chilling point, the experiment was repeated on an ingot made from

upon the supply of molten copper at the top of the ingot. This expands or rises slightly upon setting; nevertheless, it contracts more than the surrounding steel. Apparently the contraction of the copper and iron do not take place in the same relative proportion as might be expected.

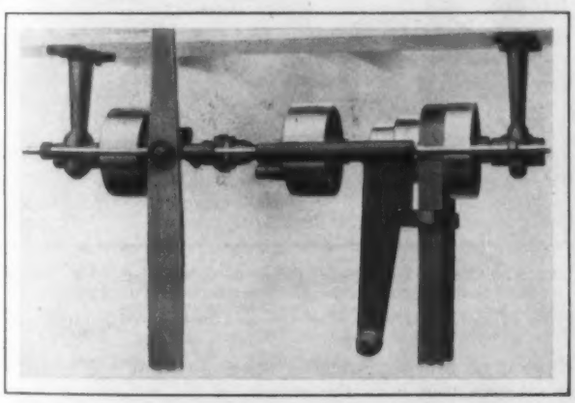


Figs. 10 and 11—Scleroscopic Tests on Two Ingots and Percentages of Copper Present at Different Portions

In conclusion, the author thinks that these experiments should throw some light upon the nature of the phenomena occurring in the cooling down of molten steel to the solid condition.

Lathe Belt Shifting Device

To do away with the difficulty encountered in shops having high ceilings in changing the speed of a belt-driven lathe without the use of a pole, the W. P. Davis Machine



A New Device for Shifting Belts on Lathe Countershafts Made by the W. P. Davis Machine Company, Rochester, N. Y.

Company, Rochester, N. Y., has brought out a new belt-shifting device. This is being applied to the company's lathe countershafts and is designed to shift the belt from one step of the driving cone pulley to another. The device is located on the shifting rod and as it has a long bearing, it is pointed out that it always remains parallel with the driving shaft. There is a large slot in the device through which the belt passes. This is placed at the proper angle for leading the belt from one pulley step to another without damaging it in any way.

Morgan T. Jones & Co., inspecting and consulting engineers, Monadnock Block, Chicago, announce the appointment of P. E. Stevens as manager of the structural steel and cement departments, with headquarters in Chicago, succeeding James A. Lister, whose association with the company ceased September 1. Mr. Stevens was formerly connected with the engineering department of the Great Northern Railway. Up to the time of the above mentioned appointment he was bridge engineer for the city of St. Paul, Minn.

Vibrating Screen for Sizing Materials

Among the special features claimed for the new vibrating screen developed by the Jeffrey Mfg. Company, Columbus, Ohio, are the exact separation of the material, the ability to vary the angle of the screening surface, an even distribution of the material across the face of the screen and a small number of moving parts. This screen will handle material of a very fine mesh or a light, fluffy or sticky nature, and in designing it the object in view was the securing of a maximum output of correctly sized material with a minimum amount of expense without introducing complications of design and operation.

Each screen is put up with a steel frame and casing, which fully incloses the screen and forms a self-contained unit ready to run. All of the moving parts are readily accessible for inspection and the shaft extends on both sides so that the driving pulleys can be shifted to one side or the other as may be required. This change, it is pointed out, can be made without necessitating any readjustment in the other parts of the screen, the change being made whenever necessary to suit the convenience of the drive. The faces of the eccentrics are made spherical and it is emphasized that this arrangement prevents them from heating or binding regardless of how much out of line they may be. The bumper blocks are readily accessible and the knock may be adjusted or changed without interfering with the arrangement of the other parts of the machine.

The screening surface is arranged with a quickly adjustable angle so that the operator is enabled to set the

Cross-Section of a New Type of Vibrating Screen with Double Screening Surfaces Made by the Jeffrey Mfg. Company, Columbus, Ohio

screen at an angle slightly less than the angle of repose of the material being screened. In this way, when the machine is not running, the material will lie on the surface of the screen without rolling or sliding down, but slight vibrations of the screening surface will cause the material to pass down the slope by easy stages, advancing a short distance with every vibration until it arrives at the bottom. This adjustment is accomplished by hanging the screen frame on a pivot shaft at one end and supporting the other by wire cables wound about a windlass in such a way that the free end of the screen frame is raised or lowered as the windlass is turned. This adjustment, which occupies but a moment, can be made at any time whether the screen is in motion or not.

Separate frames are made for the screening surfaces, each frame being complete in itself. These frames are not fastened to the vibrating frame, but are held by fingers which keep them from moving sidewise or from sliding down the screen. By lifting the lower end of the screening surfaces it is possible to remove them by sliding them out through the door at the end of the screen frame. Single, double or triple screens can be made by using one, two or three of these screening surfaces in connection with the small wood frames which act to hold the lower screens in the proper position to discharge their tailings. A cross-section through a screen having double screening surfaces is given in the accompanying engraving. In many classes of work a scalping screen can be utilized to advantage since it takes considerable work and wear off the finer or finishing screen underneath.

The shaft upon which the shaker frame is pivoted is held just outside the casing in special spring bearings which give freedom of motion in a vertical direction and thus permit the screen to vibrate. Two eccentrics driven from a single countershaft carry knocker blocks on the end of their rods, which inclose a rectangular space into which is fitted a square block bored to fit the shaft. With this arrangement, as the eccentric moves the knocker blocks up and down, they give the central block a blow first on one side and then on the other. The space between the knocker blocks may be varied by adjusting the nuts on the eccentric rods and this in turn will vary the intensity of the blow to suit the working conditions. If desired, the blows may be delivered on the top or the bottom or alternately on the top and bottom of the screen. The knock is transmitted through the shaft and spring bearings to the shaker frame and thence to the screens. The vibration is most intense at the upper end of the screen where it is most needed, but gradually decreases as the lower end of the screen is approached. The constant motion of the entire screening surface is of sufficient amplitude to throw small particles into the air and thus keep them moving toward the lower end of the screen.

The feeding device consists of a sheet steel pan with the edge turned up in a narrow flange which acts as a dam to hold the material back. In this way, it is pointed out, that the material is distributed uniformly across the entire face of the screen and the amount of feed is regulated in accordance with the character and conditions of the material to be screened and the mesh of the screen to be used. The pan is carried on the upper part of the shaker frame, from which it receives a slight and very rapid movement that shakes the material over the upturned edge in a uniform stream. The thickness of this stream or the quantity of material fed in a given time can be regulated throughout a wide range by raising or lowering the steel throat plate, the adjustment being quickly made at any time regardless of whether the machine is in operation or not.

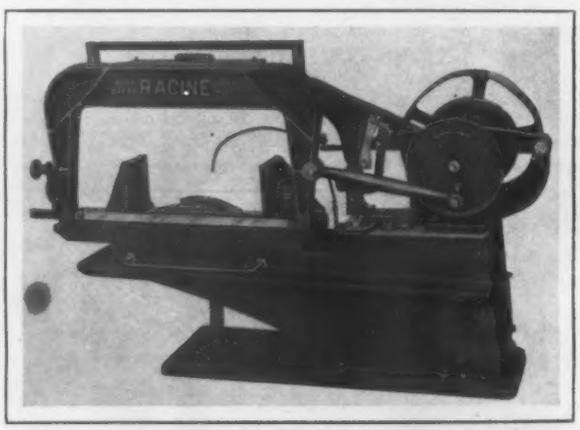
The vibrating frame and the frames holding the wire cloth are the only parts of the screen made of wood. Rock maple is employed for these parts and is used because it is more elastic and will stand the shock better than a steel construction and thus give a longer life. The corners are framed together and are reinforced by steel clips, but if in any case wood is found objectionable steel or any other material can be substituted. One, two or three curtains of duck are used as partitions to separate the fine from the coarse material, according to whether the screen has single, double or triple screening surfaces.

While the machine will operate satisfactorily when a spout from a conveyor or elevator is led into the hopper this arrangement is open to the objection that the feed is irregular, depending upon conditions in other parts of the plant, and the arrangement recommended by the builder is to spout the material directly from a bin when the screen can be made to regulate the flow of material to suit its capacity. The speed at which these screens are run varies somewhat with the character and condition of the material handled, a very dry, coarse material requiring a slightly slower speed and a fine, sticky material a somewhat high one. For general all around work the speed recommended is 250 r.p.m. for the countershaft. The power required to drive varies with the speed and amount of material being fed, but it is claimed in general practice that it rarely amounts to more than 1 hp. per screen.

Heavy-Duty Metal Cutting Machine

In addition to the No. 5 high-speed metal sawing machine which was illustrated in *The Iron Age* September 19, 1912, the Racine Tool & Machine Company, Racine Junction, Wis., has recently brought out a heavy-duty machine, which it is emphasized is a machine tool and not a hack saw. This machine, which is known as the No. 7 high-speed metal cutting machine, is adapted for cutting angles, channels, I-beams, die blocks, pipe, tubing, etc., and all parts are interchangeable and accurately machined. Among the special features found in the machine are an automatic lifting device and a quick-acting vise.

The machine operates on the draw-cut principle and on the return stroke there is an automatic lifting device by which the blade is lifted clear of the work. In this way



The New No. 7 High-Speed Heavy-Duty Metal Cutting Machine Built by the Racine Tool & Machine Company, Racine Junction, Wis.

there is no dragging back on the non-cutting stroke and it is claimed that both the output of the machine and the endurance of the blade are materially increased. The vise swivels at any desired angle and will cut any length, the capacity at any angle of 45 deg. being 11 in. Both of the jaws are adjustable and every inch of the blade can be used. The opening and closing of the vise jaws is instantaneous. The blade holders are made from a 1 x ⅜-in. flat bar fitted to a milled slot which holds the blade square with the work, thus insuring a straight cut. The blade-tightening device enables the operator to give the blade sufficient tension without the use of a wrench. The saw frame is held automatically at any desired hight, an arrangement which enables stock to be conveniently placed in the machine.

The following table gives the principal dimensions and specifications of the machine:

Maximum size of stock handled, in.	12
Minimum length of blade, in.	17
Maximum length of blade, in.	24
Over-all hight, in.	41
Hight to top of table, in.	18
Diameter of driving pulley, in.	16
Face width of driving pulley, in.	3
Floor space, in.	24½x66
Net weight, lb.	750
Shipping weight, lb.	800

To keep the blade cool while in use a cooling compound is applied to it by a geared circulating pump.

New Clamping Devices

The Massey Vise Company, Chicago, is placing upon the market the three types of clamps illustrated herewith. In the design of these tools certain novel features are included and with respect to the arrangement of the clamping screw and materials of construction, provision is made for a maximum effective grip with a corresponding strength in the clamp which is made of malleable or steel castings.

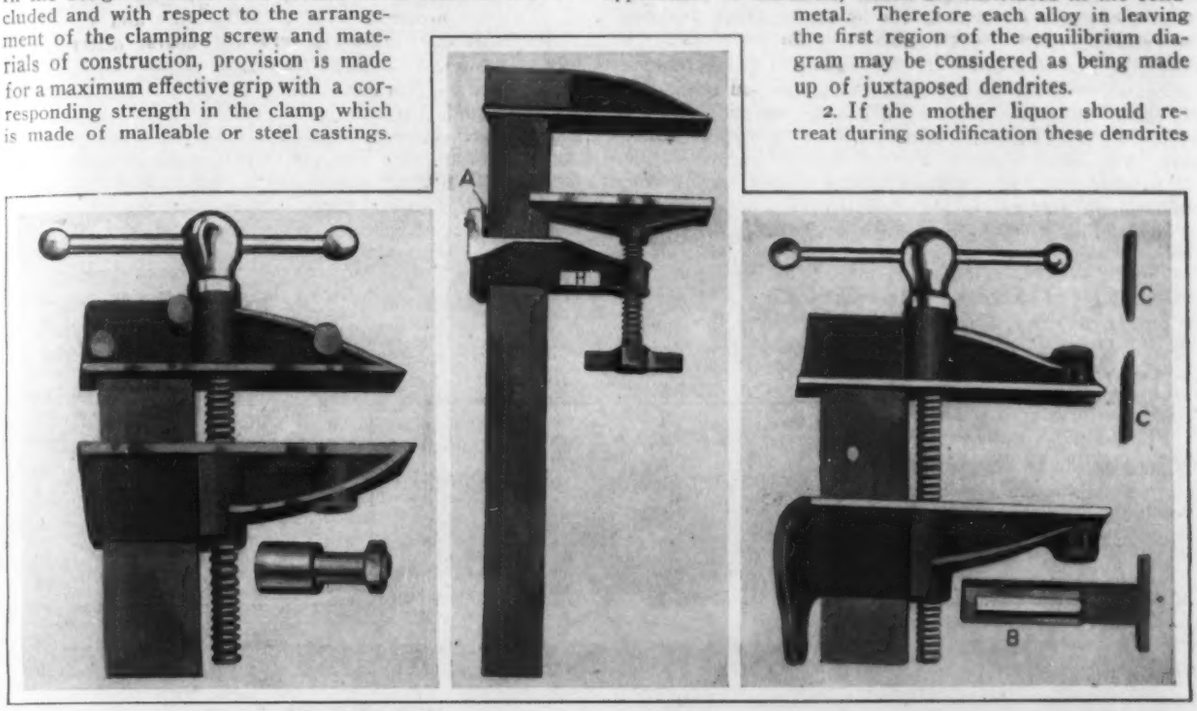


Fig. 1—The All Use Clamp Fig. 2—The H Clamp Fig. 3—The Handy Vise

Three Styles of Clamping Devices Made by the Massey Vise Company, Chicago, Ill.

Fig. 1 shows the Massey clamp in a form designed more particularly for structural work. Its special fitness for this kind of material is partially based upon the provision made for the insertion of a stud through the jaw of the clamp in such a manner as to hold channel shapes or other irregular pieces. This clamp, which has a 6-in. depth of jaw, is also serviceable for drill press work.

Fig. 2 illustrates an H clamp especially suitable for woodwork requiring heavy pressure. An additional locking device is provided by the small stud A which can be set up on the movable jaw bar.

The type of clamp illustrated in Fig. 3 may also be used as a vise and in addition it has a special feature adapted to the convenient coupling of hose. The bracket B which can be bolted on the sliding bar may be raised or lowered to support hose up to 4 in. in diameter, and tool steel pieces C may be inserted in the slots provided in the ends of the jaws so that they press the shoulders of the couplings together as the clamp is tightened. The ends of the jaws are also slotted conveniently for the insertion of a screw driver for securing the ends of the coupling. Without these special parts the vise may be used for general purposes.

Structure of Steel Cooled Slowly

A long article on the above subject is contributed to the Revue de Metallurgie by N. T. Belaiew, St. Petersburg. The steels worked on were made by the crucible process and were cooled from fusion extremely slowly right in the furnace. A cooling curve is given showing that they cooled from about 1500 deg. C. to 325 deg. C. in 60 hours. The analyses were as follows:

No.	C.	S.	P.	Mn.	Si.
1	1.80	0.022	0.026	0.15	0.30
2	2.30	0.024	tr.	0.25	0.40
5	0.60	0.019	0.024	0.14	0.50
6	0.60	0.020	0.020	0.10	0.48
7	1.10	0.025	0.024	0.50	0.08
7a	0.60	0.020	0.030	0.20	0.20
8	0.55	0.020	0.020	0.30	tr.
9	0.45	0.020	0.020	0.29	tr.
10	0.90	0.020	0.020	0.30	tr.

The very low silicon steels were prepared in crucibles lined with dolomite or magnesite; the others in ordinary steel melting crucibles. The steels were carefully examined and the structures found are fully illustrated and described in the paper. The author's conclusions are:

1. The first crystallization produced as the alloys solidify is the primary crystallization. It is shown by the appearance of dendrites, which are interlaced in the solid metal. Therefore each alloy in leaving the first region of the equilibrium diagram may be considered as being made up of juxtaposed dendrites.

2. If the mother liquor should retreat during solidification these dendrites can be clearly seen as isolated crystals and are formed of octahedrons. Therefore the octahedron is the crystallographic form of steel.

3. The dendritic structure can be observed on the surface of the steel under favorable conditions. It can also be developed on polished surfaces by the prolonged action of dilute acids. It is a macroscopic structure, clearly visible to the naked eye.

4. In the "austenite" field of the equilibrium diagram a "granulation" of the alloy takes place. In leaving this field the alloy is made up of grains, each with the orientation of the elementary octahedron, proper to itself and different from its neighbors. This structure is developed by an attack with hydrochloric acid at high temperatures. This causes the net-like structure, which is well known.

5. In the next fields of the equilibrium diagram the separation takes place of ferrite or of cementite and the pearlitic change. This is the secondary crystallization and is developed by the ordinary etching methods.

6. The secondary structure is influenced by the preceding phenomena; for instance, a eutectic tends to take its position at the joints of the granules, thus forming a sort of envelope. This gives the "cellular structure" which is often seen.

7. When the secondary crystallization takes place quickly the structural elements take positions parallel to the four sides of the octahedron and so form the Widmanstätten figures within each grain. This combination of a network with the Widmanstätten figures may be called the Widmanstätten structure.

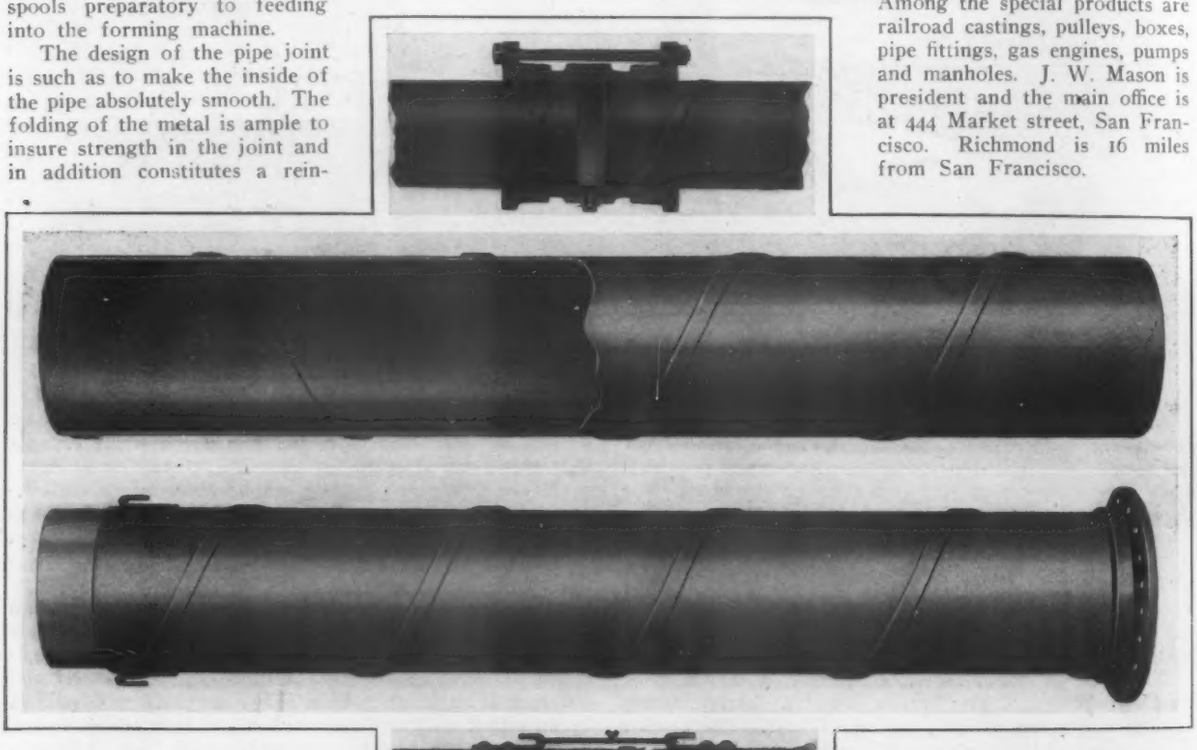
8. The third structure, that of large crystals, is usually seen in isolated crystals or in hyper-eutectic alloys. It is characterized by the coincidence of the axes of the dendrites and of deposits of ferrite and cementite. G. B. W.

One of the largest crane hooks ever made has recently been turned out at the plant of the Cleveland City Forge & Iron Company, Cleveland, Ohio. The hook has a spread of 4 ft. 4 in. and is 5 ft. 10 in. high. The diameter of its shank is 10 in. and its weight is 3600 lb. The hook was made for the Alliance Machine Company, Alliance, Ohio, to go on a 200-ton crane being built for the Carnegie Steel Company.

New Reinforced Spiral Pipe

Reinforced spiral pipe embodying a new form of construction has been placed on the market by the Standard Spiral Pipe Works, Chicago, Ill., which controls the patents covering the machines for its manufacture. The accompanying illustrations indicate the general character of the pipe and also some of the details of the continuous joint which is the special feature of this type of pipe. It is made from two strips of steel, the one being wide to form the shell and the other narrow to be used as a binding strip. The edges of these strips of steel are rolled to suitable shape for interlocking and are then rolled down under high pressure in the special machinery referred to. The forming of the sheets and the clinching of the continuous interlocking seam are consecutive machine operations, the steel emerging in the form of finished pipe. The wider strips of steel are cut from standard size sheets and the narrow strips are furnished from the mill on reels. The ends of the wide and narrow strips are welded together and mounted on large spools preparatory to feeding into the forming machine.

The design of the pipe joint is such as to make the inside of the pipe absolutely smooth. The folding of the metal is ample to insure strength in the joint and in addition constitutes a reinforcing band throughout the entire length of the pipe. The complete absence of rivet heads or any other obstruction on the inside surface of the pipe is an advantage at once apparent, both in the reduction of friction and the opportunity for foreign material gathering in the pipe. The spiral winding of the sheets in forming the pipe and the absence of any occasion for punching retains the maximum strength of the metal and permits the use of lighter gauges than are possible for the same pressures with other forms of pipe.



Two Views of a New Type of Reinforced Spiral Pipe and the Two Joints Used with It. This Pipe is a Recent Development of the Standard Spiral Pipe Works, Chicago

Bursting tests made on this type of pipe showed an hydraulic pressure of 235 lb. was necessary to burst the seam of an 18-in. No. 20 gauge test length and a piece of 16-in. No. 20 gauge pipe under a pressure of 320 lb. developed a failure in the shell of the pipe without showing any injury to the seam.

Standard reinforced spiral pipe can be supplied galvanized in lengths up to 20 ft. and asphalted in lengths up to 25 ft. The galvanizing or asphalt coating is done after the completion of the manufacturing process and fractures of the coating are thus avoided. For the joining of separate lengths of this pipe ordinary methods are used consisting of a slip sleeve joint or a joint between forged steel flanges, electrically welded to the ends of the pipe. This piping can be made for a wide range of pressures and for use in the transmission of steam, air or water.

Santa Fe Foundry Company of California

The Santa Fé Foundry Company of California, capitalized for $50,000, has purchased the plant of the Enterprise Foundry Company at Richmond, Cal., with five acres of land. It is supplied with a Santa Fé Railroad spur running the entire length. The main foundry building is 100 x 120 ft. The center part is 40 ft. wide. The foundry is equipped with a 10-ton electric traveling crane, a large core oven and three smaller ones, the latest pneumatic molding machinery and two cupolas, one of which is 8-ton and one 5-ton. The plant further includes a complete pattern shop, machine shop and brass foundry department. Iron castings of every description are made and special attention is given to large quantities of work on a manufacturing basis; high grade semi-steel for high pressure work is also made. Among the special products are railroad castings, pulleys, boxes, pipe fittings, gas engines, pumps and manholes. J. W. Mason is president and the main office is at 444 Market street, San Francisco. Richmond is 16 miles from San Francisco.

The Maryland Steel Company has decided, it is stated, to remodel its B furnace at Sparrows Point, Md. Plans include the tearing down and rebuilding of the present stack, additions in the way of modern furnace equipment and increased facilities in connection with the stock house.

The Cleveland City Forge & Iron Company, Cleveland, Ohio, will make some important improvements and additions to its plant. It has under contract a number of large forgings for shipbuilding companies. These include hull and engine forgings for an ocean steamer being built by the Craig Shipbuilding Company, Long Beach, Cal.; a 20-ton stern frame for a boat being built by the Newport News Shipbuilding & Dry Dock Company and heavy wheel forgings for a passenger boat being built by the Detroit Shipbuilding Company. It has recently finished some heavy wheel forgings for the Washington Irving, a new Hudson River boat. The Cleveland Car Specialty Company, a recently organized subsidiary of the Cleveland City Forge & Iron Company, has contracted to manufacture the product of the Franklin Railway Supply Company, 30 Church street, New York. Its product is an all-steel car roof fitted with pressed steel car lines.

Steel Prices in the Foreign Trade

Differences in Domestic and Export Basis in Germany and England

The London Iron and Coal Trades Review comments as follows on the much-discussed question of the differences between export and home prices on steel products, especially as the policy affects European markets:

One of the most interesting features of latter-day competition in the iron and steel industries of the world is the system which now obtains of making use of two sets of prices—the one for home and the other for foreign buyers. The application of that system can hardly be reconciled with the tenets of Adam Smith or of any other political economist known to fame of still later date. And yet it is that system which has mainly brought about the recent development of the foreign trade of the United States, Germany and Belgium, and which supplies the chief *raison d'être* of the powerful syndicates by which production and prices are controlled in most of the leading branches of the iron and steel trades. Curiously enough, while this dual influence is at work in our own country, it reappears in a very marked degree in countries that adopt, or profess, a totally different economic system; for German and Belgian manufacturers appear to be as much affected as our own, but after a different fashion, and it is perhaps not too much to say that they have even more cause of complaint. In order to understand the working of this system, a study of prices in different countries is absolutely necessary. It is almost obvious, however, that a mere bald statement of prices would be of little interest, and of practically no value, unless it embraced sufficient details of the conditions under which the prices were charged and paid in order to distinguish them from competitive prices; and this remark applies equally to a comparison of prices as between one country and another, and to the differences of price as between home buyers and foreign buyers, where such differences exist.

British Home Agreements Under Free Trade

So far as Germany and Belgium are concerned, the existence of material differences of price as between supplies for home consumption and supplies for shipment abroad has never been in dispute. No secret is made of the fact that such differences exist, and are adopted as part of a regular commercial system, which aims at fostering a market or markets for a surplus that cannot be consumed at home, and which is otherwise difficult or impossible of attainment. It is not so with Great Britain. Here the fiscal system in operation does not afford direct protection of any kind to iron and steel manufacturers. Hence there is but little opportunity of raising prices to home producers above a level that is more or less strictly competitive, not only as between home products, but also as between the competitive manufactures of other countries. To this general observation there are obvious limitations. By agreement between themselves, British manufacturers may, and sometimes do, keep prices at such a level above what would be the strictly competitive prices without such regulation, that the profits thus earned perhaps allow of quoting lower prices in foreign or Colonial markets in order to facilitate the disposal of a large surplus, where such surplus exists.

This condition of things has at various times existed for a longer or shorter period in various branches of the British iron and steel trades. One of the most notable cases in point at a former period was the rail pool of 30 years ago, the headquarters of which were in London, and to which both Germany and Belgium were accessory in its international stage. At a later date such an organization was attended by certain difficulties that led to its being discontinued, and for 20 years on and off there was no regular organization or regulation of production and prices in the British rail industry, although there was from time to time an understanding as to prices, which, however, could only exercise a limited control. During the last few years the regulation of output and prices has been more favorably regarded by British manufacturers, and today such regulation exists completely among makers of rails, plates, bars and structural steel. Considering the circumstances of the British manufacturer, it is pretty evident that, as he is wedded, willing or unwilling, to a free trade system, and as it is part of his case, where he desires a change of fiscal policy, to plead that he cannot do as his competitors can and do under a different economic régime, and is handicapped thereby, when he does take such a course in a limited degree, he is not likely to make public profession of his adoption of two sets of prices, designed to develop foreign trade at the expense of home consumers. In cases where this has been done, as in plates and angles, foreign and home competition has forced the maker to give back, in part at any rate, to the customer the extra price he has secured at home. In the case of Germany and Belgium it is otherwise. The distinction in question is a prominent part—for years it was perhaps the most prominent part—of their commercial régime. Very many examples of the differences in domestic and foreign prices are given in every publication issued on the fiscal policy and trade conditions of the two countries during recent years. It has for the last 10 years at any rate been recognized among the British buyers of German blooms and billets that there is a difference in their favor varying from 2s. 6d. to 5s. per ton compared with British home prices and over considerable periods more than this margin against German home consumers. The German home and foreign price is regulated by a series of rebates, the amount depending on the competition met in the market at any particular destination.

Germany's "Sacrifices" for Foreign Trade

There are several causes for the lower prices which Belgian firms are often able to quote for exports and for the usually small difference in the quotations for Belgian inland and export trade. One of these is that the Belgian market absorbs large quantities of German half-finished steel at lower prices than those at which the German rolling mills which do not possess steel plants can purchase. Another is the fact that German wages are generally higher than those paid in Belgium. Some years ago the members of the German combine in the heavy plate trade complained that their Belgian rivals, who were working up German material, had a cost of production lower than their own by 10 marks. This difference is not at all improbable. Obviously a higher cost of production on the part of the rank and file of the German iron and steel trades makes competition more difficult and compels greater sacrifices by German producers to secure foreign trade. Some of these sacrifices are little short of incredible. Rails have been sold by Germany at 90 marks, f. o. b. Antwerp, while the Prussian Railways were paying 30s. 6d. per ton more at home stations and the German Rail Combine were some years ago charging the German railroads 115 marks per ton for rails that were being sold in Portugal for 30s. per ton less. It has been largely due to the cheap material supplied by Germany that Belgium has been able of late years to secure and retain such a hold in foreign markets against the very country which has enabled her to do so. To this extent the Teuton has been "hoist with his own petard."

New Republic Open Hearth Capacity

The Republic Iron & Steel Company will begin work at once upon two additional open-hearth furnaces at its Haselton, Ohio, plant, which now consists of eight 60-ton furnaces. It is expected the new furnaces will be completed within six months, adding 7000 or 8000 tons a month to the company's ingot capacity. Details have practically been decided on also for the proposed by-product coke oven plant to be erected at Haselton. A contract will be let for 70 ovens. The company now operates three plants in the Connellsville region, making 45,000 to 50,000 tons of coke per month. Its requirements are about 75,000 tons a month, and these will be entirely met by its own works when the Haselton ovens are completed.

The Independent Pneumatic Tool Company, Thor Building, Chicago, with works at Aurora, Ill., is preparing plans for a large addition to take care of the increased demand for Thor air tools. This company has declared its regular quarterly dividend of 2½ per cent., payable October 10. It is reported that its business in the fiscal year ended September 30 has shown an increase in excess of 25 per cent. over the previous year, enabling ample provision to be made for the reserve fund.

The Foundry and the Pig Iron Market*

The Large Additions to Lake Furnace Capacity Since 1907 the Factor of Chief Significance to Foundrymen as Bearing on Costs

BY A. I. FINDLEY

Foundrymen have been raising the question, as various changes in the blast furnace industry have been reported from time to time, how these are likely to affect the supply and the price of foundry iron. The absorption by steel companies of three merchant furnaces in the Central West—one near Pittsburgh and the others in the Youngstown district—and the expected acquisition of another Mahoning Valley furnace by a steel company, prompted one of these inquiries. It came from a Pittsburgh foundryman who has been for two terms president of the American Foundrymen's Association. He had noticed similar absorptions in eastern Pennsylvania, one steel company taking over two furnaces which had long produced foundry as well as basic iron, while a second steel company acquired three furnaces in the Lehigh Valley which had for many years marketed a considerable part of their output among eastern Pennsylvania and New England foundries. Another loss from the merchant furnace ranks, in comparatively recent time, came through the purchase of a Shenango Valley merchant furnace by an ingot mold manufacturer operating in the same city.

The questions foundrymen were interested in having answered were whether these disappearances from the merchant furnace list are signs of a movement which is likely to go farther and what the ultimate effect would be on the market for foundry pig iron. In the same connection other changes in the manufacturing and marketing of foundry pig iron in recent years are attracting attention, suggesting that all developments bearing on the supply of the foundryman's chief raw material might well be considered at the same time.

It is not strange that foundrymen in districts immediately tributary to the Mahoning and Shenango Valleys should be interested in the merchant furnaceman's status. For 15 years in that district it has been precarious. With regularity in that period the passing of the merchant furnaces as a factor in the iron trade of the valleys has been predicted. In years more recent the steel companies have built more and more blast furnaces, and as their buying of pig iron in the market has come at rarer intervals it has been made plain that the merchant furnace producing steel-making iron would find its field of operations constantly narrowing. But no harm could come to the foundryman in all this. Its tendency would be to increase the competition in foundry pig iron, except as new open hearth steel plants of smaller size were raised up to take the steel making iron no longer wanted by the large companies.

New Foundry Iron Capacity

If we answer our foundryman's question in the light of new blast furnace construction in the past five years, we shall find that any absorptions of merchant furnaces have been far overbalanced by the building of furnaces to make pig iron for the market. Beginning with 1907, the record of additions to merchant furnace capacity, with the estimated yearly output is as follows:

In 1907: Toledo No. 2, Josephine No. 1, Federal No. 1, Mayville B and Perry—545,000 gross tons a year.

In 1908: Vanderbilt No. 2, Wickwire X (70 per cent. merchant), Miami, Jisco and Ironton—355,000 tons a year.

In 1909: Federal No. 2 and Cleveland No. 2—255,000 tons a year.

In 1910: River No. 1, Wickwire Y, and Zug Island No. 2—350,000 tons a year.

In 1911: River No. 2 and Josephine No. 2 completed, but not blown in until 1912—250,000 tons a year.

In 1912: Two Iroquois and two Rogers-Brown (Buffalo)—510,000 tons a year.

Here is a total of 2,265,000 tons of foundry pig iron capacity added since January 1, 1907, in a period marked, between the panic of October, 1907, and the early summer of 1912, by a demand for foundry products materially less than the average for the three years preceding the panic. Not all of this more than 2,000,000 tons capacity will necessarily be burdened for foundry iron all the time. Some of it will run on basic iron at times, but it is all owned by companies engaged in the foundry iron trade and therefore represents potential, and very largely actual, foundry iron production.

Three-Fourths of the Expansion in the Lake Region

It is of interest to note in what districts this expansion in capacity has been most marked. Nearly 75 per cent. of it, or 1,665,000 tons a year, is located in Lake cities—South Chicago, Detroit, Toledo, Cleveland, Erie, Buffalo—where Lake ores are unloaded directly into furnace yards and hence where cost of manufacture is low. A further significant fact is that the builders of all of this 75 per cent. of the foundry iron capacity added in the past five and a half years have their own ore supply, either by direct ownership or through connected ore interests, and some of them have coke connections. These furnaces, therefore, will be making iron under conditions which would close down many other stacks, as some of them demonstrated in the trying years last past. In fact, if the prices at which some of them sold in the closing months of 1911 are a criterion, there is no probable degree of distress in the foundry trade to which they will not be able to accommodate themselves.

Foundry Iron Production in Recent Years

That there has been no such expansion in the foundry capacity of the country in the past five years as would call for all the product of these 19 new furnaces, scarcely need be said. It is almost equally obvious that some of these furnaces will market their iron at times by displacing the product of furnaces having higher costs. Something of the course of the foundry industry in the past 10 years may be gathered from the statistics of production of foundry iron (including ferro-silicon) and malleable Bessemer which are as follows, as given in the reports of the American Iron and Steel Association:

Production of Foundry and Malleable Bessemer Pig Iron, Gross Tons

1902.....	4,162,734	1907.....	6,071,499
1903.....	4,882,804	1908.....	4,052,579
1904.....	4,090,758	1909.....	5,980,463
1905.....	5,393,274	1910.....	6,103,570
1906.....	5,472,712	1911.....	5,081,473

There were imports of a few hundred thousand tons in 1902 and 1903 and another import movement amounting altogether to about 500,000 tons in 1906 and 1907. But there was also some accumulation at home in 1907 and a more marked home accumulation in 1910. It is probable, therefore, that the home consumption of foundry and malleable grades (Bessemer, basic and low-phosphorus irons melted by steel foundries are not included above) was under 6,000,000 tons in 1907, one of the two high years in the table, and considerably under that figure in 1910, the other. Last year, in spite of the known reduction of foundry pig-iron stocks, the consumption was probably not much above the average for the three lean years preceding, which was so conspicuously reduced by the low rate of 1908. Conditions were thus ripe for the forward movement of which there are now so many proofs.

Southern Irons in the North

The competitive situation in foundry iron in Northern markets has long been thought of as turning on the supply of Southern pig iron. Southern foundry iron has been looked upon as a necessity in certain percentages and for certain uses. More than that, the possibility that on the score of cheapness it would at times displace Northern irons in certain districts has been held up as a check on prices, not only of Northern foundry irons, but of the Lake ores entering into them. The course of the market

*Presented at the Buffalo convention of the American Foundrymen's Association, September, 1912.

in the past five or six years has some suggestion on these points. But first it will be of interest to note the contribution of Alabama and Tennessee to the production of foundry iron shown in the table above. For the same 10 years the figures are as follows, no account being taken of basic or forge irons:

Production of Foundry Iron in Alabama and Tennessee—Gross Tons.

	Alabama.	Tennessee.	Total.
1902	1,044,874	328,975	1,373,849
1903	1,194,556	350,966	1,545,522
1904	1,085,935	253,185	1,321,120
1905	1,094,149	311,880	1,406,029
1906	1,117,262	376,722	1,493,984
1907	1,113,340	337,737	1,451,077
1908	884,920	255,945	1,140,865
1909	1,280,798	291,162	1,571,960
1910	1,200,346	308,749	1,509,095
1911	1,240,808	275,091	1,515,899

While Alabama and Tennessee produced 29.5 per cent. of the total in the first five years of the 10, they produced but 26 per cent. in the second half of the period. It is significant that in the list of 21 new furnaces given above, the South contributed only one, and that of 75,000 tons yearly capacity, or 3 1/3 per cent. of the total. At the same time the South is using more of its foundry iron in its own foundries. Capacity for machinery castings probably has not increased measurably in the South since the panic; but a large radiator plant has been built that will draw most of its iron from the South, a similar plant in Alabama is about to be built and a large Southern soil pipe foundry has been completed. Cast-iron pipe works are the main consumers. Some Alabama furnaces are now disposing of about one-third of their foundry iron product south of the Ohio River. It is true that Tennessee furnaces have few closely contributary consumers; but the important fact is that Southern foundry iron is a diminishing factor in the mixtures of Northern foundries.

Higher Phosphorus Northern Irons

It has become increasingly evident that price is the determining factor in the marketing of Southern iron. A high phosphorus content has brought a considerably higher price at times for Southern iron from a Northern stove plate or light gray iron foundry. But Northern furnaces have been meeting the demand for phosphorus. A marked development in the practice of some of those in the Lake cities is the use of higher phosphorus ores, bringing the phosphorus in the pig up to 0.60 to 1.00 per cent., and, in the case of one iron, up to 1.50. Lake Superior ores answering this purpose are not plentiful, but development in the Crystal Falls district of Michigan is adding to the supply, and in one case a high phosphorus ore from southern Ohio has been drawn upon by a Lake front furnace.

It is good testimony to the better methods of mixing and melting foundrymen are mastering that they are now able to use to a greater extent than ever the iron that can be delivered the cheapest. In the period of unprofitable prices through which furnacemen have been passing the low quotations in such competitive markets as Chicago and the furnace centers on Lake Erie have alternated between Southern and Northern irons. In Chicago some years ago Northern iron usually brought from 25 to 50 cents a ton higher than Southern. In the recent depression the conditions have been reversed and Northern iron in the Chicago market has undersold that from the South, a condition that still exists.

Grade Numbers Disappearing

Much as has been said about the practice of larger foundries of buying their pig iron on analysis, the extent to which classification by numbers has been discarded is probably not appreciated. When the foundryman buys by number he gives the seller a considerable leeway on silicon—50 points usually, and if this is stretched out to 75 the average buyer would be none the wiser. With close regulation of this mixture by analysis the foundryman is now drawing in the lines on silicon and specifying a desired analysis so that in some cases sales turn on the matter of 0.25 per cent. silicon. The recent increase in the use of silicon as the basis of purchases indicates that the time is not far away when pig-iron numbers will be eliminated from transactions and the price determined by a specified content of silicon, with other elements exerting an influence on price where an unusual and special content of these is stipulated.

The whole foundry iron situation has been so dominated in the past three years by depressing influences that one must not generalize too far concerning changes in foundry practice that have had their influence in that period. Aided by the extreme cheapness of basic pig iron, some of the steel foundries have made very low prices, to the displacement at times of forgings and malleable castings and perhaps gray iron castings; but time will be required to show whether the inroad is permanent. Malleable foundries at the same time have cheapened their mixture, due to the same cheapness of basic iron, buying off-basic, an iron in which the silicon was higher than steel works would accept. This competition from basic furnaces has affected the price of malleable Bessemer, which has at intervals been below its normal parity with No. 2 foundry iron.

Some very good work has been done in the direction of giving charcoal iron a larger place in car wheel and special mixtures. There have been some results, and the demand upon the railroads for freight car wheels that will better stand the heavy service of recent years is helping the movement. But price is so controlling an influence in railroad buying that the low level of coke pig iron has held down the charcoal product and much is yet to be done to secure recognition for it on the score of quality. In chilled work and for castings requiring a special selection of raw material charcoal iron is making headway and the outlook has been sufficiently promising to encourage some addition to the capacity of Michigan charcoal furnaces in the past three years. Lately Mayari pig iron, which owes its properties to a small content of nickel and chromium, has been offered as a component of chilled roll mixtures and for castings requiring special strength.

Declines in Castings Offset by Lower Pig Iron

Throughout the late depression foundry wages have been maintained. There has thus been thrown upon the management the necessity of getting greater efficiency from labor and of introducing every possible economy in mixing and melting, as well as in the mechanical operations of the shops. It was the original intention to include in this paper some data indicating how the shrinkage in market prices for castings in this trying period compared with the decline in prices of pig iron and scrap. A number of representative jobbing foundries were addressed, and while some responded with definite data, there were numerous cases in which the costs of light and heavy work were not so separated as to permit of proper comparisons, due to the varying percentages of these classes of castings from month to month. Possibly this disclosure will supply a text to the advocates of more exact knowledge of foundry costs. So far as the figures furnished permit of deductions, they indicate that foundry pig-iron prices in 1911 showed a falling off from the level of 1907 quite equal to and in some cases greater than the shrinkage in prices of castings. The foundryman, with proper attention to his cupola, and with the development of economies in molding machine operation to which hard times furnish the spur, has apparently not fared as badly on the whole as the blast furnaceman.

What has been written above as to the steady increase in foundry iron capacity in Central Western districts in the past five years is not intended to bear on the immediately future course of the market for foundry iron. In that problem a number of factors are involved which cannot be gone into here. But enough has been said to indicate that foundrymen have no reason for anxiety over anything that has happened thus far in the way of absorption of merchant blast furnaces. What has been pointed out as to the lessening of the supply of Southern iron for sale in the North is of interest to Northern foundrymen regularly depending on such iron for a part of their mixture. But the factor of first importance in the whole question of foundry iron supply and demand is the prodigious addition made in and since 1907 to the foundry iron capacity of the country. Of chief significance in that connection is the fact that in the Lake cities from Buffalo on the east to South Chicago on the west such additions have brought the foundry capacity of these cities up to 3,000,000 tons a year. In other words, this cordon of 27 furnaces between the foot of Lake Michigan and the foot of Lake Erie now represents a capacity equal to half the consumption of foundry iron in the United States in the high record year. The question of supply, and, generally speaking, at a moderate level of prices, is therefore one about which foundrymen need have no early concern.

Allied Foundrymen's Meetings in Buffalo

Last Week's Conventions of Iron, Steel and Brass Foundrymen and the Contemporaneous Exhibition of Foundry Equipment

The annual meetings of foundrymen and the exhibition of foundry machinery and equipment in Buffalo last week were on all sides pronounced as pre-eminently satisfactory. As mentioned last week, in the report of the activities up to Tuesday evening, September 24, the annual meetings of three different associations—the American Foundrymen's Association, the American Institute of Metals and the Associated Foundry Foremen—were as usual held simultaneously, and as in other years an exhibition managed by a co-operative association of manufacturers, the Foundry & Machine Exhibition Company, was held. A large percentage of the papers submitted for discussion covered what may be called matters of the directly available, practical sort, and the attendance and interest was unusually good. This fact, but particularly the popularity of the exhibition and the considerable amount of business reported as actually consummated by exhibiting companies, are especially interesting in giving a decidedly definite color to the active expansion of the foundry industry at this time. The papers in both the ferrous and non-ferrous meetings included contributions on special practices, on late developments in mechanical appliances for the foundry and considerable on management, safety and sanitary arrangements. The attention paid to the steel foundry in the American Foundrymen's Association was noteworthy. In addition to the interest in the technical matters, however, it was, as stated, remarkable how many participants in the meetings came with the avowed purpose of making purchases for their foundries after a study of what could be seen at the exhibition. Every exhibitor interviewed seemed to have done an amount of business beyond his expectations.

Below will be found accounts of the Wednesday and Thursday meetings of the American Foundrymen's Association and of all of the technical sessions of the American Institute of Metals. In *The Iron Age* of September 19 were given at length the general arrangements for the exhibition and an outline of the productions exhibited by the different participants, so that nothing further may be said in this connection at this time, though it is likely that some of the unusual and new contributions to foundry operation will find their way in the near future in these pages It should be stated, however, that the elaborate story of iron in motion pictures, this including views acknowledged to be the most ambitious ever attempted of the industrial works and covering the blowing of the Bessemer converter and the rolling of the ingot, was the star attraction of the Rogers, Brown & Co. exhibit and of the exhibition as a whole. Incidentally the result of a guessing contest conducted at the exhibit is reported elsewhere in this issue. Immediately following will be found a brief report of the meeting of the Associated Foundry Foremen and a few words regarding the entertainment arrangements, which the lack of space does not give the opportunity to discuss at length, may be found following the account of the technical sessions.

The Associated Foundry Foremen

The Associated Foundry Foremen, it was remarked at different times in the week, was likely to disband as an organized entity and its members affiliate with the American Foundrymen's Association as associate members. These rumors appeared not to be well founded as the association held its meetings as usual and elected new officers with the important change that the retiring president was made secretary-treasurer and voted a small salary and the plan was inaugurated toward making the office a means for bringing the employer in touch with men capable of serving as foundry foremen. The association held its usual banquet on Tuesday evening. The association adjourned to meet in connection with the next meeting of the American Foundrymen's Association and its officers for the ensuing year are as follows:

President, Robert Walker, Abendroth Brothers, Port Chester, N. Y.

Vice-President, P. M. Woodin, Reeve & Co., Columbia, Ind.

Secretary-Treasurer, Robert B. Thompson, Buffalo Pitts Company, Buffalo, N. Y.

The American Foundrymen's Association

Electric Welding

The first paper presented at the Wednesday morning session was that of J. F. Lincoln, Lincoln Electric Company, Cleveland, who discussed electric welding, describing particularly the Lincoln electric welder. He claimed that in welding in connection with a steel casting a weld of a strength exceeding 60,000 lb. per square inch can be guaranteed, and whether the weld is so strong or stronger than the casting depends on whether the filling material used for the weld is a stronger metal than the original casting. The steel foundry, he said, was the first place where electric welding was used commercially. He referred to a case where one welder resulted in a saving of $200 a day for seven months through the saving of otherwise damaged castings.

Paul Kreuzpointner, Altoona, Pa., regarded one of the virtues of the electric welding process as lying in the fact that there is no deterioration of metal on each side of the point of welding. Welding ordinarily results in a decided increase of temperature to a distance of 6 to 8 in. beyond the welding point and beyond the zone of subsequent hammering or rolling, and therefore out of the region where the structure of the metal can be restored.

The 12-Hour Shift in the Steel Foundry

An unusually valuable contribution to the discussion on the advisability of converting a 12-hr. shift to one of 8 hr. in the steel foundry was presented in a paper by R. A. Bull, Commonwealth Steel Company, Granite City, Ill., printed in full elsewhere in this issue. John H. Ploehn, steel foundry superintendent, Bettendorf Axle Company, Davenport, Ia., told briefly how in his plant the period of working was reduced practically from 12 hr. to 9 hr. The daily rate was changed to an hourly rate by dividing by ten, but the average number of hours per day per man has worked out at 9, instead of 10, as stated. The point is that all of those working on a furnace are really not needed after the furnace is tapped; in other words, there come times when three men are not needed, but one will do, and any extra help can be obtained from men engaged on another furnace. He feared the scheme would hardly work where there was only one furnace in the plant. The company has saved something in wages, has given the men shorter hours and maintained general efficiency.

Mr. Bull offered to give to inquirers further information, particularly that which could not well be incorporated in a paper.

Equipment of the Steel Foundry

Under the title "Some Salient Points of the Modern Steel Foundry" Samuel R. Robinson, metallurgist, Duquesne Steel Foundry Company, Coraopolis, Pa., described the advancement in the different departments of the steel foundry in recent years.

Prof. Bradley Stoughton regarded the use of iron pipes instead of firebrick tuyeres in the converter as advantageous, in that the incoming blast oxidized iron first encountered and the oxide fluxes with the lining where firebrick is used. He referred to the fact that for this reason coke breeze is used in the bottom of the bottom-blown

converter to deoxidize the iron oxide and the use of iron pipe served the same purpose. He favored the use of low silicon iron, but was not prepared to agree that low silicon made the blows quieter.

A paper on "Open-hearth Design and Manipulation as Applied to the Steel Foundry" was read by Mr. Ploehn. Mr. Bull commended the practice of providing separate bins for sorting and storing scrap according to the carbon content. Then in making a charge the chemist specifies the quantities of old rails, springs, car couplers, shop scrap, pig iron, etc. Mr. Ploehn in reply to a question said that, while 1 ton of metal had been melted with 38 gal. of fuel oil, the average of 1000 heats was 45 gal. per ton, not counting oil used in Sunday heating of the furnace, the figures being for actual melting. The author also described the sand handling system in his plant, involving belt conveyors. Sand, flasks, etc., are brought to the molders, who work continuously without regarl to casts, the molding and pouring floors being separate. An advantage is that sand is stored and allowed to cool at the shaking-out hoppers, and, of course, molders do no shaking out.

Economies in the Cleaning Room

A paper on the "Economical Cleaning of Castings" was read by B. H. Reddy, mechanical engineer, W. W. Sly Mfg. Company, Cleveland. He seemed to regard with favor an air pressure of 40 lb. for the air blast for sand blasting, saying that to supply air and sand at a cleaning rate faster than the operator can take advantage of in moving the nozzle is a waste of energy. Nozzles are not practically reversible because they cut out toward one side, though theoretically such a double use is warranted. Sand blasting in connection with steel castings has resulted in a reduction of returned castings to 2 to 3 per cent. because inspectors can see the exact conditions of the surface of the castings.

Papers Relating to the Cupola

The session of Thursday morning, September 26, was opened with the presentation of papers by A. H. Stein, Hauck Mfg. Company, Brooklyn, N. Y., and Prof. John Jermain Porter, Staunton, Va. Mr. Stein described the practice and advantages of lighting the cupola by means of the Hauck oil burner. Professor Porter, whose paper was printed in last week's issue, discussed the subject of close-grained soft cast iron. A paper entitled "Mystery versus Chemistry in Grading Pig Metal," also printed last week, was read by Thomas D. West, West Steel Casting Company, Cleveland, Ohio.

Titanium Alloy for Cast Iron

A paper on the cleansing effect of titanium on cast iron was read by Prof. Bradley Stoughton. In introducing the subject he said it was estimated that nearly 1,000,000 tons of material would be treated by titanium this year, and probably 500,000 tons of this were steel rails. It is used for nonferrous metals; it hardens and strengthens aluminum and increases its resilience but its effect on copper is more marked. It is one of the ten common elements in the earth's crust. It has been known since 1791 but it is less than four years since titanium has been useful in an industrial way. It has a great affinity for oxygen and greater for nitrogen than for any other element. It is the only substance which burns in the presence of nitrogen with incandescence. The literature of titanium contains more than 1000 references in substantially all the languages of the known world.

H. D. MILES,
President American Foundrymen's Association.

Professor Stoughton cited numerous test results showing the varying degrees of increase and decrease in tensile strength and other properties resulting from the application to cast iron of the ferro-titanium alloy. In his own tests he had hoped, by introducing the alloy on the bed of the cupola, to secure the deoxidizing effect of the alloy at a point where such treatment is most desired, but the results were substantially negative. One point is that the alloy must not be allowed to reach the slag. When used in the cupola the cupola must be drained continuously of the slag and the tuyeres must be low and the periodic rising and lowering of the level of the molten iron prevented, otherwise there is a waste in the deoxidization of the slag. He also described experiments where the ladle had to be carried a long distance to the point of use, these observations emphasizing the necessity of having the iron as hot as possible, as the alloy results in a cooling of the metal and it requires also say 3 min., to allow for the action of the alloy. The problem of the use of the alloy with cast iron, particularly the impossibility of counting on a positive benefit, conditions of treatment, etc., being otherwise constant, has not, Prof. Stoughton emphasized, been solved. He admitted of course that it was very valuable in clarifying the metal, but especially in this respect with steel.

In the discussion, Thomas D. West told how he was disappointed in the lack of uniformity of results in his experience with both vanadium and titanium in cast iron. Professor Stoughton did not find great differences in this respect with iron of different constituency, though with melted sash weights an increase of 15 per cent. in strength had been obtained by the alloy treatment. He mentioned that the alloy does not develop on new alloy, as one must remember that only 10 lb. of alloy is used with 1 ton of iron and its effect is chiefly a cleansing one. Charles V. Slocum, Titanium Alloy Mfg. Company, suggested that one cannot expect much additional strength to the cast iron with the small amount of alloy given to the iron. He regarded the alloy as valuable in increasing the density of the iron and made it particularly available for chilled roll manufacture. It can be used in the cupola, the air furnace or in the ladle. He suggested that anyone trying to begin with the alloy should start with a small percentage, working up gradually as need be.

W. A. Bole, Westinghouse Machine Company, described experiments made at the Trafford City foundry. With a stock in a 40-ton air furnace of known and uniform quality, test bars of treated and untreated iron showed differences so small as to be practically negligible. On the other hand, with a later use of poor stock, like grate bars, and a relatively large quantity of the alloy, he was surprised at the good results, producing such articles as automobile fly wheels, which were quite satisfactory. He believed, however, in striving for good iron at the outset.

It was the view of a number that the ferro-titanium was particularly useful as a scavenger and to be used when good iron was not being produced. Mr. Slocum added that 10 test bars of iron from old grates treated with the alloy gave an average of 3005 lb. transverse test, with 2865 lb. minimum. He mentioned also that it is not economical to add a considerable percentage of the alloy, as the cost becomes that of good iron. A small percentage does not increase the values of the physical properties, but gives uniform results and smooth, workable castings.

(Continued on page 812.)

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Shorter Hours at Steel Plants

The paper read before the American Foundrymen's Association at Buffalo last week by R. A. Bull on "The Economic Side of the Twelve-Hour Shift in the Steel Foundry," which is found elsewhere in this issue, throws further light on the problem with which steel manufacturers have been dealing. Mr. Bull speaks from the standpoint of the smaller operation of the steel foundry, but some of his arguments should therefore be the stronger when applied to the more exacting demands upon workmen in large open-hearth plants, especially where the 12-hour shift and a seven-day week are in force, as is still the case at some periods in certain plants. Mr. Bull takes strong ground against the 12-hour shift on the furnace platform, declaring it to be "absolutely unjust, humanely speaking." His account of the change made at Granite City, Ill., from a 12-hour shift to an 8-hour shift and the comparison of the one régime with the other are instructive and of importance, in view of the author's belief that "any careful comparison along the lines indicated by the record herein shown would convince any steel manufacturer of the wisdom of operating with three eight-hour shifts, purely from an economic standpoint."

For a good many reasons the eight-hour shift will be a long time coming into use in open-hearth plants, though the difficulties of providing some measure of relief for workers on furnace platforms should not prove insuperable. The problem for some time to come will be to maintain adequate working forces for the present régime; the day when it would be possible to get 50 per cent. more men for such work is in the indefinite future. The question of pay would be equally serious. The men would not be satisfied to earn only two-thirds the present wage, and their employers could not by any reasonable possibility advance them 50 per cent. At Granite City advances of 18 to 20 per cent. in the hourly rate seem to have been satisfactory. If the experiences of such steel companies as are now enforcing a six-day week at all their plants are a criterion, one of the chief difficulties in maintaining such a régime is the opposition of the employees themselves. Recently at an Ohio plant a number of men were asked to put in a Sunday on repair work. They agreed, but with the stipulation that they should not be required to take a day off in the ensuing week, in conformity with the rule of the company that every man should have one day off in seven. The management declined to meet the condition and consequently the repair work was done on Monday. Even the exhausting labor in open-hearth departments does not prevent many workmen from circumventing the rule of the six-day week. Cases are constantly coming to light in which men work six days in open-hearth works and on their day off do a day's work at blast furnaces, where they appear on the pay roll under another name. It is common for men whose day off is a week day to spend it in labor on some outdoor contracting job under way in the vicinity, earning thereby an extra $2 or more. It is well known, moreover, that the companies which are enforcing the six-day week have been steadily losing men to those which work their men seven days in the week.

While this attitude of many workmen toward a movement undertaken in their interest will not cause a reaction toward longer hours, it has something of comment in it on the muck-raking preachments about seven-day slavery in the steel industry.

The Truth About Steel Exports

Some glaring illustrations of the misuse of statistics occur in the article of Louis D. Brandeis in Collier's Weekly of September 28, the second in a series undertaking to deal with the platforms of the three political parties with respect to the "trust" issue. As we do not deal with purely political matters, we merely mention the fact that Mr. Brandeis undertakes to defend the position that the two old parties present a good, and the new party a bad, method of dealing with the "trust" question. We are directly interested in his specific deductions drawn from an alleged survey of our iron and steel export history, because they are not fairly founded upon fact, and the iron and steel public is entitled to an honest and correct presentation.

Mr. Brandeis undertakes to show that the United States Steel Corporation has not been a distinct force toward the upbuilding of an iron and steel export trade and would have his readers believe that this trade would now be larger had not the Steel Corporation been formed. This is a weird undertaking, from the viewpoint of those familiar with the iron and steel industry.

Mr. Brandeis cites, as the basis of his argument, the fact that the total tonnage exports of the United States increased from 1,154,000 tons in 1900 to 1,533,000 tons in 1910. In doing so he places himself in the position either of having been very careless in selecting his facts or of having purposely selected figures which would best suit his preconceived conclusion. The citation of 1,154,000 tons exported in 1900 as a fair basis for comparison is entirely unfair for two reasons. In the first place, those exports were exceptionally heavy, comparing with less than a million tons in any preceding year, and with 372,000 tons in 1902, the year before the one in which the United States Steel Corporation organized its export subsidiary and instituted a comprehensive campaign for the building up of an export trade. In the second place, the tonnage of 1900 was composed very largely of the cruder materials, particularly pig iron, billets, sheet bars and rails. In recent years the proportion of these cruder products has been much smaller, and the proportion of more finished products has been correspondingly larger. Thus the selection of 1900 as the year for starting the comparison is unfair, and the basing of the comparison upon the mere matter of tons is likewise unfair.

The citation of the year 1910 as the second for the comparison is not illuminating or fair. In asking his readers to accept his arguments Mr. Brandeis is under the obligation which any fair-minded writer assumes, of endeavoring to give his readers the latest pertinent facts. The 1,533,000 tons exported in 1910 is not the latest pertinent fact. The exports in 1911 were 2,188,000 tons, and in recent months the exports have been at the rate of more than 3,000,000 tons.

Unfair in his selection of statistics, Mr. Brandeis is unhappy in his selection of authorities, for he quotes the words of T. Good as an authority: "From the moment that the steel trust got to work the American iron and steel industry was diverted from natural to unnatural developments. Costs and prices of raw material were inflated; progress toward economy was arrested; retrogression set in, and America's rosy chances of annexing the world's export trade were shattered." Mr. Good is not an authority upon American iron and steel conditions, and Mr. Brandeis has certainly placed himself in an awkward position by recognizing him as such, for it is not so long ago that Mr. Good published a somewhat violent article holding that the profits of the United States Steel Corporation have been miserably small. Can Mr. Brandeis find any place in his writings for quoting that conclusion of his expert with approval?

Having undertaken to show, by figures not fairly selected, that our tonnage iron and steel exports have not greatly increased, Mr. Brandeis passes on to explain that the large value of our iron and steel exports at present is due, not to the tonnage items constituting the trade in which the Steel Corporation predominates, but to highly manufactured products, like tools and machinery. His remarks on this head are wholly misleading, for an adequate study of this feature points to a conclusion diametrically opposite to his main contention. As with the other statistics he uses unfairly, a complete presentation of these statistics shows that the proportion of tonnage iron and steel exports, relative to exports of tools, machinery, etc., has increased very substantially since the steel corporation was formed. Although tools, machinery, etc., do constitute a large percentage of our total iron and steel exports, they do not constitute as large a percentage as formerly. They have shown an absolute increase, but a relative decrease, and this relative decrease is because they have not been able to keep pace with the rapid increase in the tonnage exports due to the success of the steel corporation's export operations. In *The Iron Age* of July 25, 1912, under the caption, "Our Exports of Iron and Steel Manufactures" we presented a compilation for the years 1904 to 1911 inclusive, splitting the iron and steel exports into those for which the tonnage is reported and those for which it is not, and showing the proportion which the tonnage value constituted of the total value for each year. We now reproduce that table, carried back to the year 1898. These statistics clearly show that the value of tonnage exports—those in which the Steel Corporation predominates—has increased greatly since the Steel Corporation was formed, though both classes have increased. In the three years preceding the birth of the Steel Corporation the proportion was 26 per cent., while in 1911 it was 35 per cent., and it may be added that this year the proportion is running still higher.

Values of Iron and Steel Exports, Tonnage and Non-tonnage.

Years.	Tonnage Classes. Gross tons.	Tonnage Value.	Non-tonnage Value.	Total Value.	Proportion of tonnage value. Per cent.
1898...	901,427	$18,095,244	$64,676,306	$82,771,550	21.9
1899...	942,689	25,162,220	80,526,857	105,689,077	23.8
1900...	1,154,284	42,518,072	87,115,408	129,633,480	32.8
1901...	700,857	29,050,446	73,484,129	102,534,575	28.4
1902...	372,398	20,996,450	76,895,586	97,892,036	21.5
1903...	326,590	20,452,839	78,583,026	99,035,865	20.7
1904...	1,167,710	42,551,109	86,002,504	128,553,613	33.1
1905...	1,010,255	42,104,348	100,824,165	142,928,513	29.4
1906...	1,325,740	52,215,089	120,340,499	172,555,588	30.3
1907...	1,301,979	60,046,221	137,020,560	197,066,781	30.4
1908...	964,242	43,397,323	107,715,791	151,113,114	28.8
1909...	1,239,709	50,783,138	106,897,193	157,680,331	32.2
1910...	1,537,952	63,276,714	137,995,189	201,271,903	31.4
1911...	2,187,725	86,598,670	163,057,741	249,656,411	34.6

Having shown a decided lack of diligence in consulting the statistics actually available, and having discussed unfairly those actually selected for citation, Mr. Brandeis does not create surprise in disclosing lamentable ignorance in discussing what are more directly plain business questions. He says that "America has to-day, in all lines of competitive business, concerns large enough to be the most efficient instruments of commerce, be it foreign or domestic." That is obviously untrue. The independent steel producers of to-

day cannot conduct an export trade as conveniently and economically as the Steel Corporation is doing; nor could the fragments of the corporation, if it were dissolved, as Mr. Brandeis appears to advocate. The magnitude of the Steel Corporation's operations in the export trade are undoubtedly a great economy, and it is idle to assume otherwise.

An equal amount of ignorance is shown in the effort to attribute to the Steel Corporation the rise in the cost of production since it was formed. This increase has been practically universal throughout American industries, and a similar rise has occurred in the cost of steel manufacture abroad. The bald fact is that iron and steel prices in the United States and abroad are not greatly dissimilar. Prices in the American market are lower to-day, relative to prices abroad, than they were in the year in which the United States Steel Corporation was formed. Can Mr. Brandeis harmonize that bare fact with what he has printed in his magazine articles?

Copper in Steel Rails and Sheets

Mention has been made recently of an experimental order placed by the St. Paul road with a Chicago district mill for rails containing 0.6 per cent. copper. The order calls attention not only to the various expedients of the railroads to secure better-wearing rails but to the interest taken latterly in copper additions to steel as a means of improving quality. A user of structural steel only lately took up with a large steel company the rolling of shapes containing copper, being confident that the product would better resist corrosion than ordinary structural steel. In this case, moreover, the material was wanted for a building and not for a bridge or other structure exposed to the elements. The inquiry may have been prompted by the fact that copper has been made use of by one or two manufacturers of sheets to make their product more resistant to corrosion. While the tests of such sheets have not been sufficiently numerous or extended to permit of an exact appraisal of the added value of the copper, a number of investigators have gone far enough to satisfy themselves that copper contributes materially to the rust-resisting properties of sheet steel; also that the amount required for this purpose is not such as to raise any question of commercial feasibility. In fact, the use of sheets containing a small percentage of copper is already considerable and is increasing.

In the case of the St. Paul rails the properties expected from the copper are not disclosed specifically, beyond the general statement that the aim is to get a rail with more resistance to wear. The cost of the copper required for a ton of rails, on the basis of 0.6 per cent., figures out $2.40 for 2240 pounds, with copper at 17.75 cents. The rails in question are not wanted for tunnel or other service involving unusual rusting, so that the reason applying in the case of sheets does not exist. It happens that the copper percentage specified is exactly that found in 80-lb. rails taken up by the Lackawanna railroad a few years ago, that were rolled at the old Scranton, Pa., mill. A good many such rails were laid on this line, the copper content going back to the Cornwall ores used in the blast furnaces of the Lackawanna Iron & Steel Company. These rails gave good service, albeit there was also a sulphur content which would be ruled out by the average railroad specification. It might be supposed that sulphur with copper would make trouble for the mill with the red-shortness imparted by sulphide of copper, but where the sulphur was not high enough to develop trouble in the rolling the combination was evidently not detrimental in service.

It is not so long ago that copper in steel was restricted to about the limits imposed for sulphur, but the more recent tendency has been not only to regard it as no detriment, but, as has been indicated, as conferring benefits. It would be an interesting development if eventually the copper content of certain iron ores should command a premium for steel into which they entered, assuming a very thorough elimination of sulphur.

The Machine Tool and the Association

The National Machine Tool Builders' Association is taking a mail ballot of its members, in the effort to secure a new name for the organization. The ballot is a yes or no vote on the acceptance of the name "American Metal Working Machinery Constructors' Association," and blanks are left for the writing in of suggestions. The members are of different minds as to the wisdom of the proposed name, many favoring it, others believing it too long but conveying the correct idea, while still others would prefer to retain the present title. The purpose of the ballot is not to come to an immediate decision, but to get at the opinion of the association, that final action may be taken at the approaching annual meeting or upon some later occasion.

The root of the trouble is the chaos in machinery nomenclature resulting from customs decisions of recent years. As was shown in the synopsis of these decisions given in *The Iron Age* of February 29, 1912, page 524, various forms of machinery have been pronounced "machine tools," which would be excluded from such classification as accepted in the trade. At the hearings on the Underwood tariff bill, which put machine tools on the free list, some of the Congressmen were surprised to know that large machines came under this designation. The framers of the bill seemed not to know what they had done. Another difficulty has been that the words have no literal translation into other languages. American manufacturers thoroughly understand the term, which has been accepted for years, yet the words are difficult of brief definition. The term machine tool covers the group making up the equipment of a shop that fashions metal into machinery and tools. At the same time the identical types are used for manufacturing other things than machinery. They include such classes as horizontal turning machines, to use the name which some members of the association have substituted for lathes; milling machines, drilling machines, planing machines, shaping machines, grinding machines. They run over into the automatic and semi-automatic machines which perform a labor formerly confined to these older classes. But the term does not include wire-drawing machines, rolling mills, wire-forming machines and other special lines, and a wide range of machines which work metal and use tools. Until recently punching and shearing machines, presses and all equipment for cutting up sheet metal were not recognized by the association as machine tools. But everything in this list is a metal-working machine.

The proposed new association name would broaden the scope of the organization, if its membership were defined by the title. Doubtless this would be a step

forward. Such is the opinion of a considerable group of members, and recent additions to the roll prove that the more liberal policy has made its beginning.

The case in a nutshell is that the association has the option of changing the name of the class of machinery which its members manufacture, and with it the name of the organization, or of carrying out, systematically and assertively, a campaign of education to define clearly a machine tool as it is understood in the trade. With a correct nomenclature of the machines themselves, an improvement which has already made much progress, the types included can be better compiled into a list. In a tariff bill it might be possible to include the list, in order to differentiate from machinery which is foreign to the machine shop as we know it to-day. Possibly the most efficient method would be to urge Congress to drop the term machine tool and substitute the broader one of metal-working machine. If the term is to have no official recognition by the Government, that might be a reason for its elimination from the name of the association. If it is to be maintained, it would be difficult to give the association a better name.

Correspondence

Responsibility of Manufacturers for the Training of Workmen

To the Editor: Referring to the editorial on page 730 of *The Iron Age* of September 26, entitled "Unskilled Labor or None," I indict the business men of the country

a. With having failed to give adequate consideration to the educational needs of our own laboring people. Had these been supplied, their earning power, and consequently their purchasing power, would be vastly increased. Until this market is fully developed we do not need to worry about our exports.

b. With constantly endeavoring to bring in skilled workmen from outside and leaving our own people to starve for want of the proper industrial education.

c. With failing to realize, if the educational systems of the country do not provide for the proper industrial training of the individual, that the business men must assume this duty as a part of their regular business and of the function of management.

d. With closing their eyes and ears tightly to any effort on the part of those who, as is proving to be the case, are more clear and far-sighted than they, to inform them as to the facts and help them to meet the situation.

The trade journals, which should help to educate the business men, are not free from contributory negligence by any means and this includes *The Iron Age*.

H. F. STIMPSON.

BROOKLYN, N. Y., September 26, 1912.

President Farrell on Labor Conditions

An Address at the Launching of a Lake Steamer Named in His Honor

James A. Farrell, president of the United States Steel Corporation, and a large number of officials of the subsidiary companies attended the launching of the lake freighter James A. Farrell September 28, at the Lorain, Ohio, yards of the American Shipbuilding Company, where it is being built for the Pittsburgh Steamship Company. As a tribute to President Farrell, more elaborate ceremonies were carried out than usual in connection with a launching. The day was practically a holiday in Lorain and the city showed its civic pride by a parade in which the school children and others participated. The city's part of the programme was arranged by the Lorain Board of Commerce. A reception committee of that organization met the guests on their arrival in special electric cars from Cleveland. The honor of naming the boat was bestowed on Miss Theresa Farrell, daughter of President Farrell. After the launching the shipbuilding company entertained the guests, about 500 in number, at luncheon in the mold loft in its plant. Brief speeches were made by President Farrell and others, including H. P. Bope, general sales manager Carnegie Steel Company; W. B. Schiller, president National Tube Company; W. P. Palmer, president American Steel & Wire Company; E. J. Buffington, president Illinois Steel Company; James C. Wallace, president American Shipbuilding Company; W. N. Little, representing the Lorain Board of Commerce, and W. H. Hughes, city solicitor of Lorain. Attorney James H. Hoyt, of Cleveland, was toastmaster. President Farrell spoke in part as follows:

Safety is the paramount idea in these times, not only in the minds of shipowners, but shipbuilders as well. During the past ten years the average number of vessels totally lost was less than 1 per cent. of the number actually engaged in the bulk carrying trade. Accidents are sometimes unavoidable, but the percentage of fatalities is lower on the Great Lakes than on any other body of water in the universe, principally due to two reasons—first, the efficiency of those who man these ships, and, second, because the present type of construction and safety appliances minimizes to a great extent the dangers of navigation.

The first shipment of iron ore, amounting to 3,000 tons, was made from the Marquette range in 1854, and some idea of the growth of ore shipment can be had when it is considered that 45,000,000 tons of ore is scheduled to move in 1912. This tonnage is carried in about 400 steamers, making approximately 15 to 20 voyages, with an average cargo of about 7,000 tons each.

The development of the shipbuilding and steel industries in Lorain is typical of the progress made in this locality during the past decade. From the beginning of construction work by the Lorain Steel Company to the subsequent expansion under the National Tube Company, the history of Lorain has been one of continual progress. The plant originally designed to roll street railroad rails has been enlarged by the addition of open hearth furnaces, also of a large plant for the manufacture of tubes, until to-day a capacity has been reached of 200,000 tons of rails and 400,000 tons of tubular products yearly.

The Steel Corporation has a common interest with you in the welfare of your city and of its employees. It has been a modern, well-equipped and efficiently managed manufacturing industry employing upward of 6,000 men who, with their families, constitute the major portion of your community. It has been its policy to utilize a large part of its earnings for the benefit of its employees, as well as its stockholders, in the development of its properties.

The Steel Corporation also is keenly alive to the mutuality of interest between employer and employee, and its constant aim has been to evidence its interest in the welfare of its employees. This has been indicated by the advanced position it has taken, at very large outlay, in inaugurating the voluntary relief plan, in case of disability, pension benefits to employees of long service, and a systematic programme for the prevention of accidents, and, what is equally important, sanitary environment for its properties. In former times mill employment conditions were strikingly different. As a worker in the mills myself for many years, conditions past and present are matters of personal knowledge.

The fact that some of our employees accept employment elsewhere because of opportunity to work seven days continuously per week, as compared with our policy of operating our plants six days, leaving the seventh or Sabbath day for such observance as best suits the individual, does not alter our belief that six days' continuous work is sufficient and best for the interests of all.

In addition to the speakers named above, the following heads of subsidiary companies of the Steel Corporation were present: Harry Coulby, president Pittsburgh Steamship Company; A. F. Banks, president Elgin, Joliet & Eastern Railroad; F. E. House, president Duluth & Iron Range Railroad Company; E. W. Pargny, president American Sheet & Tin Plate Company; Joshua A. Hatfield, president American Bridge Company of New York; August Ziesing, president American Bridge Company; Daniel Coolidge, president Lorain Steel Company; E. M. Hagar, president Universal Portland Cement Company; W. J. Olcott, president Oliver Iron Mining Company; W. A. McDonagle, president Duluth, Missabe & Northern Railroad Company, and E. P. Thomas, president United States Steel Products Company.

The steamer James A. Farrell will be the finest vessel in the Steel Corporation fleet and will be fitted with elaborate passenger quarters. The boat is 600 ft. long, 58 ft. beam, 32 ft. deep and will have an ore carying capacity of 12,000 gross tons.

The Iron and Metal Markets

Steel Making Iron Higher

Pig Iron Output Increasing While Stocks Decline

Mills Not Selling Heavily for Next Year—Early Ore Contracts for 1913

The ease with which prices of steel-making pig iron have risen in the Central West and the fact that there is considerable unsatisfied inquiry for such iron still cause interest to center in that market. Valley furnaces have been prompt to ask advances and to-day $16.50 appears to be minimum for Bessemer iron. In basic iron sales of 10,000 tons are reported at $15.50, Valley furnace, while $16 is now commonly quoted.

The largest sales of the week were made at St. Louis—15,000 tons of Southern and 10,000 tons of Northern basic. Inquiries from steel foundries in that district call for a minimum of 15,000 tons, with a possible 30,000 tons, Chicago and Valley producers being in competition for this business.

Foundry iron at Valley and northern Ohio districts has moved to a higher level; in other Northern districts there has been little or no change. An important machinery interest at Pittsburgh has bought upward of 20,000 tons for plants in the Pittsburgh and Cleveland districts. At Buffalo from 75 to 80 per cent. of the furnace capacity is sold up to July 1 and some other furnaces on Lake Erie are equally heavily booked.

Conditions are such that furnaces are not crowding sales for next year, indications appearing that a good many buyers will yet be in the market for large blocks of iron. Preliminary returns from blast furnaces for September indicate an increase of at least 10 in the number of active furnaces, but at the same time stocks have gone down and consumption of steel-making iron is at a record rate.

Southern furnaces are making sales at advancing prices; $13.50 is now minimum for No. 2 iron at Alabama furnaces and sales have been made at $14.

Finished steel is working toward higher prices. Mills are somewhat reserved in selling for next year. It is plain that a very large tonnage entered for 1912 will carry over into 1913. Leading Pittsburgh and Chicago interests see practically a six months' full operation ahead of them, in view of the present condition of order books and the rate at which new business has been coming out.

A definite order is reported from the Pennsylvania Railroad for 50,000 tons of rails for the Lines West, this being placed to insure early rolling. It is expected the Pennsylvania total will reach 250,000 tons. Recent orders by the Central of New Jersey and the Lehigh Valley amount to 25,000 tons. Inquiries pending for cars, and likely soon to become orders, amount to about 17,000, including 4500 for the Northern Pacific, 5000 for the Pennsylvania and 2000 each for the Erie and the Chicago & Northwestern.

Sales of sheets and tin plates for 1913, following the opening of the manufacturers' books last week, have been considerable, but producers buying their steel in the market are cautious, since the leading steel companies are not selling sheet bars yet for forward delivery. The situation as to semi-finished steel is in fact causing some concern. The large interests have been embarrassed this year by their heavy sales to rolling mills; they see now that after their own finishing mills are supplied they will have little for the market in the early months of next year. The scarcity of steel for early delivery is more acute and advances of 50 cents to $1 a ton have been made at Pittsburgh in the past week. In eastern Pennsylvania sales of open hearth rolling billets for first quarter have been made at $28, delivered.

Shafting manufacturers have advanced prices to a 60 per cent. discount. This represents $2 a ton advance, and to those who have sold at 63 off, a $3 advance.

There has been no formal advance in wire products, though some wire nail business for 1913 is reported at $1.75, while $1.70 is the basis of the leading sellers. September maintained the good rate of August in new wire orders and specifications. One seller has advanced wire rods to $28, Pittsburgh.

The trend of the coke market is more distinctly toward the seller's position. After large contracts for 1913 at $2.50 for furnace coke, sales are reported at $2.75.

Lake Superior ore sellers are looking for early buying for 1913, and it is not unlikely that a large part of next year's output will be sold before January. Estimates of the advances that will be made upon 1912 prices range from 50 cents to $1 a ton.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics.

At date, one week, one month and one year previous.

	Oct. 2, 1912.	Sept. 25, 1912.	Sept. 4, 1912.	Oct. 4, 1911.
Pig Iron, Per Gross Ton:				
Foundry No. 2, standard, Philadelphia	**$17.00**	$16.85	$16.25	$15.00
Foundry No. 2, Valley furnace.	**15.50**	15.00	14.25	13.25
Foundry No. 2, Southern, Cincinnati	**16.50**	16.25	15.50	13.25
Foundry No. 2, Birmingham, Ala.	**13.25**	13.00	12.25	10.00
Foundry No. 2, at furnace, Chicago*	16.50	16.50	15.50	14.50
Basic, delivered, eastern Pa.	**16.50**	16.00	16.50	14.50
Basic, Valley furnace	**15.50**	14.75	14.25	12.60
Bessemer, Pittsburgh	**17.40**	16.90	15.90	15.55
Malleable Bessemer, Chicago	17.00	17.00	15.50	14.50
Gray forge, Pittsburgh	**15.90**	14.90	14.65	13.65
Lake Superior charcoal, Chicago	17.75	17.75	16.25	16.50
Billets, etc. Per Gross Ton:				
Bessemer billets, Pittsburgh	**25.00**	24.00	23.00	20.00
Open hearth billets, Pittsburgh	**26.00**	24.50	23.50	19.00
Forging billets, Pittsburgh	32.00	32.00	29.00	25.00
Open hearth billets, Philadelphia	28.00	28.00	25.40	21.40
Wire rods, Pittsburgh	**28.00**	27.00	27.00	26.00
Old Material, Per Gross Ton:				
Iron rails, Chicago	**17.50**	17.00	16.50	13.75
Iron rails, Philadelphia	17.00	17.00	16.50	16.50
Car wheels, Chicago	**15.50**	14.75	14.00	12.50
Car wheels, Philadelphia	14.25	14.25	14.00	11.75
Heavy steel scrap, Pittsburgh	**15.00**	14.50	13.75	12.25
Heavy steel scrap, Chicago	**13.25**	13.00	12.25	10.00
Heavy steel scrap, Philadelphia	14.50	14.50	14.50	12.00

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Finished Iron and Steel,	Oct. 2, 1912.	Sept. 25, 1912.	Sept. 4, 1912.	Oct. 4, 1911.
Per Pound to Largest Buyers:	**Cents.**	**Cents.**	**Cents.**	**Cents.**
Bessemer rails, heavy, at mill..	1.25	1.25	1.25	1.25
Iron bars, Philadelphia.....	1.52½	1.47½	1.40	1.22½
Iron bars, Pittsburgh.....	1.50	1.45	1.40	1.20
Iron bars, Chicago	1.50	1.45	1.45	1.20
Steel bars, Pittsburgh	1.35	1.35	1.30	1.15
Steel bars, tidewater, New York	1.51	1.51	1.46	1.31
Tank plates, Pittsburgh.....	1.40	1.40	1.40	1.20
Tank plates, tidewater, New York	1.56	1.56	1.56	1.36
Beams, Pittsburgh	1.40	1.40	1.35	1.25
Beams, tidewater, New York....	1.56	1.56	1.56	1.41
Angles, Pittsburgh	1.40	1.40	1.35	1.25
Angles, tidewater, New York..	1.56	1.56	1.56	1.41
Skelp, grooved steel, Pittsburgh	1.30	1.30	1.25	1.15
Skelp, sheared steel, Pittsburgh	1.35	1.35	1.30	1.25
Sheets, Nails and Wire,				
Per Pound to Largest Buyers:	**Cents.**	**Cents.**	**Cents.**	**Cents.**
Sheets, black, No. 28, Pittsburgh	2.15	2.15	2.05	1.85
Wire nails, Pittsburgh	1.70	1.70	1.70	1.65
Cut nails, Pittsburgh.....	1.60	1.60	1.60	1.50
Fence wire, ann'l'd, 0 to 9, Pgh.	1.50	1.50	1.50	1.50
Barb wire, galv., Pittsburgh....	2.00	2.00	2.00	1.95
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt shipment	$2.65	$2.50	$2.15	$1.50
Furnace coke, future delivery..	2.50	2.50	2.25	1.60
Foundry coke, prompt shipment	3.00	2.75	2.40	1.85
Foundry coke, future delivery.	3.00	2.75	2.50	2.10
Metals, Per Pound:	**Cents.**	**Cents.**	**Cents.**	**Cents.**
Lake copper, New York.....	17.87½	17.75	17.75	12.50
Electrolytic copper, New York.	17.70	17.70	17.62½	12.25
Spelter, St. Louis.....	7.50	7.50	7.20	5.85
Spelter, New York.....	7.65	7.65	7.35	6.00
Lead, St. Louis	4.95	4.95	4.72½	4.32½
Lead, New York.....	5.10	5.10	4.85	4.47½
Tin, New York	50.25	50.10	47.20	40.15
Antimony, Hallett, New York..	9.37½	8.87½	7.87½	7.70
Tin plate, 100-lb. box, Pittsburgh	$3.60	$3.60	$3.50	$7.60

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.40c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 316 in., take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.....	.10
Gauges under 3-16 in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10.....	.30
Gauges under No. 10 to and including No. 12.....	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over.....	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.....	.30
Still bottom steel	.30
Marine steel	.40
Locomotive fire box steel.....	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inc.	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inc.	.50
Cutting to lengths or diameters under 1 ft.....	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, $28. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.50 galvanized, $1.80. Galvanized barb wire, to jobbers, $2; painted, $1.70. Wire nails to jobbers, $1.70.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.65	$1.70	$1.75	$1.80	$1.90	$2.00	$2.10	$2.20
Galvanized	1.95	2.00	2.05	2.10	2.20	2.30	2.70	2.80

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in., on one or both legs, ¼ in. and over, and zees, 3 in. and over, 1.40c. Other shapes and sizes are quoted as follows:

	Cents per lb.
I-beams over 15 in.....	1.45 to 1.50
H-beams over 18 in.....	1.45 to 1.50
Angles over 6 in.....	1.45 to 1.50
Angles, 3 in. on one or both legs, less than ¼ in. thick, plus full extras, as per steel bar card Sept. 1, 1909.....	1.45 to 1.50
Tees, 3 in. and up.....	1.45 to 1.50
Angles, channels and tees, under 3 in. plus full extras as per steel bar card Sept. 1, 1909....	1.45 to 1.50
Deck beams and bulb angles.....	1.70 to 1.75
Hand rail tees	2.15 to 2.30
Checkered, trough and corrugated floor plates...	2.30 to 2.55

Extras for Cutting to Length.

	Cents per lb.
Under 3 ft., to 2 ft. inclusive.....	.25
Under 2 ft., to 1 ft. inclusive.....	.50
Under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.

	Cents per lb.
Nos. 3 to 8	1.50
Nos. 9 and 10	1.55
Nos. 11 and 12	1.60
Nos. 13 and 14	1.65
Nos. 15 and 16	1.75

Box Annealed Sheets, Cold Rolled.

Nos. 10 to 12	1.80
Nos. 13 and 14	1.85
Nos. 15 and 16	1.90
Nos. 17 to 21	1.95
Nos. 22, 23 and 24.....	2.00
Nos. 25 and 26	2.05
No. 27	2.10
No. 28	2.15
No. 29	2.20
No. 30	2.30

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11	2.30
Nos. 12, 13 and 14.....	2.40
Nos. 15 and 16	2.55
Nos. 17 to 21	2.70
Nos. 22, 23 and 24	2.85
Nos. 25 and 26	3.00
No. 27	3.15
No. 28	3.30
No. 29	3.45
No. 30	3.60

Effective April 18, 1912, the rates for painted and formed roofing sheets, per 100 lb., are based on the following extras for painting and forming over prices for corresponding gauges in black and galvanized sheets:

Corrugated Roofing Sheets by Weight.

Painting.	29	25 to 28	19 to 24	12 to 18
Regular or oiling	...	0.15	0.10	0.05
Graphite, regular	...	0.25	0.15	0.10
Forming.				
2, 2½, 3 and 5 in. corrugated	0.05	0.05	0.05	0.05
2 V-crimped, without sticks..	0.05	0.05	0.05	...
⅝ to 1¼ in. corrugated.....	0.10	0.10	0.10	...
3 V-crimped, without sticks..	0.10	0.10	0.10	...
Pressed standard seam, with cleats	...	0.15	0.15	...
Plain roll roofing, with or without cleats	0.15	0.15	0.15	...
Plain brick siding	...	0.20	...	...
3-15-in. crimped	0.20	0.20	0.20	...
Weatherboard siding	...	0.25	0.25	...
Beaded ceiling	..	0.25	0.25	...
Rock face brick and stone siding	...	0.25	0.25	...
Roll and cap roofing, with caps and cleats	0.25	0.25	...	...
Roofing valley, 12 in. and wider	...	0.25	0.25	...
Ridge roll and flashing (plain or corrugated)	...	0.65	0.65	0.65

Boiler Tubes.—Discounts on lap welded steel and standard charcoal iron boiler tubes to jobbers in carloads are as follows:

Steel.		*Standard Charcoal Iron.*	
1¼ to 2¼ in.....	62	1½ in.	46
2½ in.	64½	1¾ to 2¼ in.....	48
2¾ to 3¼ in.....	69½	2½ in.	53
3½ to 4 in.....	72	2¾ to 3¼ in.....	55½
5 and 6 in.....	64¼	3½ to 5 in.....	58
7 to 13 in.....	62		

Locomotive and steamship special grades bring higher prices.

2½-in. and smaller, over 18 ft., 10 per cent. net extra.

2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe (card weight), in effect from September 10, 1912, one point greater being allowed on merchant weight; iron pipe (full weight), from September 3, 1912:

Butt Weld.

Steel.			Iron.		
Inches.	Black.	Galv.	Inches.	Black.	Galv.
⅛, ¼ and ⅜	72	52	⅛ and ¼	65	48
½	76	66	⅜	67	51
¾ to 3	79	71	½	70	57
			¾ to 1½	73	62
			2 and 2½	74	63

Lap Weld.

2	76	68	1¼	58	48
2½ to 6	78	70	1½	69	59
7 to 12	76	66	2	70	61
13 to 15	53	..	2½ to 4	72	64
			4½ to 6	71	63
			7 to 12	69	56

Plugged and Reamed.

1 to 3, butt	77	69	1 to 1¼, butt	71	60
2 lap	74	66	2, butt	72	61
2½ to 4, lap	76	68	1¼, lap	56	46
			1½, lap	67	57
			2, lap	68	59
			2½ to 4, lap	70	62

Butt Weld, extra strong, plain ends.

⅛, ¼ and ⅜	68	58	⅜	64	53
½	73	67	½	68	61
¾ to 1½	77	71	¾ to 1½	72	63
2 to 3	78	72	2	73	64

Lap Weld, extra strong, plain ends.

2	74	66	1½	66	60
2½ to 4	76	68	2	67	61
4½ to 6	75	67	2½ to 4	71	64
7 to 8	68	58	4½ to 6	70	63
9 to 12	63	53	7 and 8	64	54
			9 to 12	59	48

Butt Weld, double extra strong, plain ends.

½	63	57	½	58	50
¾ to 1½	66	60	¾ to 1½	61	53
2 to 2½	68	62	2 to 2½	63	55

Lap Weld, double extra strong, plain ends.

2	64	58	2	56	50
2½ to 4	66	60	2½ to 4	61	55
4½ to 6	65	59	4½ to 6	60	54
7 to 8	58	48	7 to 8	53	43

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Pittsburgh

PITTSBURGH, PA., October 2, 1912.

Sales of finished steel products for next year's delivery are now proceeding apace in several lines, particularly in sheets and tin plates, in which the market formally opened last week. The mills, however, are somewhat reserved in selling, on account of uncertainties as to prices and supplies of raw materials. The unfinished steel situation has reached a serious stage as there is very little material to be obtained for this year's delivery and the mills are refusing to quote for first quarter, representing that they will have less steel than usual to spare from their own finishing mills, and will have to carry over considerable unfilled business in billets and sheet bars from this year. On an average, the mills feel that they can count certainly on six months of full operation, based on the present condition of order books and the rate at which new business is coming in. This applies even to tubular goods, in which as a rule sales are not made far ahead. An advance in wire products has been looked for as likely to occur this week, but no announcement has been made as yet by any of the producers. Under date of yesterday cold rolled shafting is advanced two points, or about $2 a ton, making the regular discount 60 per cent.

Pig Iron.—Prices have been advancing rapidly, with sales of moderate volume on the way up. Several lots of Bessemer, aggregating a fair tonnage, have been sold at $16.50, Valley furnace, which appears to be the bottom of the market. Within the past few days 10,000 tons or more of basic have been sold at $15.50, Valley furnace, and it is questioned whether any more can be secured at this price. Foundry iron has moved on a parity with basic, although sales have not been so large. While some buyers have been taking hold somewhat freely at the advancing prices, there is a disposition among others to await developments, seeing that they are already covered fully to the close of this year, and in many cases fairly well into next year. The September pig iron averages, as compiled by a local selling firm from sales of 1000-ton lots and over, are announced at $15.962, Valley, for Bessemer and $15.134 for basic. These are sharp advances, comparing with August figures of $14.543 for Bessemer and $14 for basic, making $1.428 advance for Bessemer and $1.134 advance for basic. We quote standard Bessemer pig iron at $16.50 to $16.75; basic, $15.50 to $16; malleable, $15.25 to $15.75; No. 2 foundry, at $15.50 to $16, and gray forge pig iron at $15 to $15.50, all at Valley furnace, the freight to Pittsburgh being 90c. a ton.

Billets and Sheet Bars.—The amount of semi-finished steel available in the market has become extremely limited, most of the mills refusing to quote at all for any delivery, asserting that they have sold all the steel they can spare. Consumers are asking quotations for first quarter's delivery, but as a rule the mills are refusing to quote. Brokers in some instances are effecting deals whereby they give the mill pig iron for first quarter and secure steel in return. The market is quotable approximately as follows: Bessemer billets, $25 to $25.50; Bessemer sheet bars, $25.50 to $26; open-hearth billets, $26 to $26.50; open-hearth sheet bars, $26.50 to $27; axle billets, $30; forging billets, $32, all f.o.b. maker's mill, Pittsburgh or Youngstown. Sales of about 3000 tons of Bessemer and open-hearth sheet bars have been made at the prices quoted.

Ferroalloys.—While the majority of sellers of ferromanganese have advanced their contract price $3 a ton, to $59.50, Baltimore, there seem to be one or two sellers still at the old price of $56.50. Prompt material is bringing $60 and higher, but only in limited lots, these prices being at Baltimore, with $1.95 freight to Pittsburgh. We quote 50 per cent. ferrosilicon in lots up to 100 tons at $72.50; over 100 tons to 600 tons, $71.50, and over 600 tons, $70.50, Pittsburgh. The lower grades are ruling at $20 for 10 per cent., $21 for 11 per cent., and $22 for 12 per cent., f.o.b. cars at Ashland, Ky., or Jackson, Ohio. On ferrotitanium we quote 8c. per lb. for carload lots, 10c. per lb. in 2000-lb. lots and over and 12½c. per lb. in lots up to 2000 lb.

Steel Rails.—No large orders for standard section rails are reported as booked by the local interest in the past week, but the demand for light rails is active, both in specifications on contracts and in new sales. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45-lb. sections, 1.25c.; 16 and 20-lb., 1.30c.; 12 and 14-lb., 1.35c., and 8 and 10-lb., 1.40c., all in carload lots f.o.b. Pittsburgh.

Wire Rods.—The mills are advancing prices on rods, and one mill is stated to have refused some good business at less than $28, mill. We quote Bessemer, open hearth and chain rods at $28, Pittsburgh.

Muck Bar.—The market has been quiet, as there is very little material available. We quote standard makes of muck bar firm at $31, Pittsburgh.

Skelp.—The skelp market is very firm, but prices are unchanged, and we continue to quote grooved steel skelp at 1.30c. to 1.35c.; sheared steel skelp, 1.35c. to 1.40c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.75c. to 1.80c., delivered at buyer's mill in the Pittsburgh district.

Structural Material.—The fabricators are well filled with business for several months to come, and are not soliciting new business for late delivery. On hurry jobs they are regularly quoting premiums, where they quote at all. An interest which is putting up a building contracted for last spring finds that it will cost 70 per cent. more to arrange for an extension, although the contractor is now at work on the ground. We quote beams and channels up to 15 in. at 1.40c. to 1.45c., Pittsburgh.

Plates.—While the leading local interest is quoting 1.40c. on plates deliveries are hard to secure, and the smaller mills, which are able to make quick deliveries, are readily securing 1.45c. and even 1.50c. We quote the market at 1.40c. to 1.45c. for plates ¼ in. and heavier.

Iron and Steel Bars.—The mills are congested with business in steel bars, specifications coming in at a lively rate, while contracts are freely entered into for first quarter. The bar mills regard it as certain that they will be fully employed into the second quarter of next year. We quote steel bars at 1.35c., Pittsburgh. Iron bars are firmer than a week ago, 1.50c., Pittsburgh, being the minimum quoted. Makers of steel bars quote the following extras for twisting: ¾ in. and larger, $1 per net ton; ½ and ⅝ in., $2 per net ton.

Hoops and Bands.—The new demand continues good, with excellent specifications on contracts. We quote bands at 1.35c., with extras as per the steel bar card, and hoops at 1.45c., Pittsburgh, for the remainder of this year and into first quarter.

Sheets.—Buyers have been making active inquiry for sheets the first quarter, most of the mills having opened their books last week for that delivery. The mills are

pursuing a cautious policy about making sales, as it is not known what their costs will be with the rapid advance in pig iron and steel, and in the case of galvanized sheets the spelter question is also a serious one. For black sheets the mills able to make reasonably early deliveries are readily obtaining premiums of about $2 a ton, and some mills are quoting a minimum of 2.25c. on black sheets for any delivery. Mill operations are at the maximum rate possible, with steel frequently hard to obtain and labor scarce in most sections. Last Thursday the Youngstown Sheet & Tube Company announced the adoption of a new list of differentials for galvanized sheets, the rearrangement effecting an advance of 5c. per 100 lb. on No. 29 and on Nos. 22 to 24. It is stated that the change is made because the previous differentials did not take account of the actual manufacturing cost in these gages as compared with others. At the same time the announcement is made that the sale of 11½ oz. material as such is discontinued, there having been the curious practice in the trade of selling 11½ oz. stock at less than No. 29, although it is identical with it. Since this announcement six or seven sheet manufacturers have signified their adoption of the new list, and it promises to become general. We quote No. 10 blue annealed sheets at 1.55c. to 1.60c.; No. 28 black, 2.15c., and No. 28 galvanized at 3.30c. for the remainder of this year and first quarter of next year.

Tin Plate.—The tin mills are still operating at full capacity and prospects are that they will have little idle capacity for the remainder of the year. Contracts are being entered into for next season, but there is no rush as yet. The mills are not particularly anxious to sell on account of uncertainties as to the cost of their raw materials. We quote $3.60 per box for 14 x 20 coke plates, f.o.b. Pittsburgh, for delivery the remainder of this year and into next year.

Shafting.—Effective October 1, prices of shafting have been advanced two points, the discounts now being 60 per cent. off in carloads and larger lots and 55 per cent. in small lots, delivered in base territory. For some manufacturers the new prices represent $3 a ton advance, as they had been selling at 63 per cent. off. The new demand continues heavy and specifications against contracts are still coming in very freely. All the makers are practically filled up for this year, and are booking orders for delivery in first quarter of next year at present prices. It is stated that already a considerable tonnage has been sold for first quarter delivery.

Bolts and Rivets.—The demand continues fairly heavy. All the makers have their output sold for the next three or four months, and have booked a good deal for delivery into next year. It is not unlikely that a further advance in price of bolts may be made in the near future, as it is stated that present prices are based on much lower costs of raw material. We quote: Button head structural rivets, $1.90 per 100 lb. base; cone head boiler rivets, $2 in carloads only, an advance of 10c. to 15c. being charged for smaller lots. Discounts on bolts are as follows: Coach and lag screws, 80 and 12½ per cent. off; small carriage bolts, cut threads, 75, 10 and 2½ per cent. off; small carriage bolts, rolled threads, 75, 10, 2½, 7½ per cent. off; large carriage bolts, 70, 10 and 2½ per cent. off; small machine bolts, rolled threads, 75, 10, 7½ per cent. off; small machine bolts, cut threads, 75, 10, 5 per cent. off; large machine bolts, 70, 10 and 10 per cent. off; square hot pressed nuts, blank and tapped, $5.90 off, and hexagon nuts, $6.55 off. These prices are in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works.

Spelter.—The demand is heavy, and the market continues very firm. We quote prime grades at 7.45c., East St. Louis, equal to 7.57½c., Pittsburgh.

Railroad Spikes.—Railroads continue to specify heavily against contracts, one road having sent in specifications last week for about 15 000 kegs. A good many spikes have been closed for delivery over the first quarter and first half of next year. All the spike makers have their entire product sold up for sometime ahead and are not inclined to book any more business for delivery this year. We quote railroad spikes in base sizes, 5½ x 9/16 in., and also small railroad and boat spikes at $1.80 per 100 lb., f.o.b. Pittsburgh, for remainder of this year and first quarter of 1913.

Wire Products.—Persistent reports of an advance of $1 a ton in prices of wire and wire nails are incorrect, but it is the general belief that it may be made in the near future. A few contracts for wire nails for delivery in the first quarter of 1913 have been made at $1.75, an advance of 5c. over prices ruling for this year. The market is very strong. Shipments of wire nails in September were very much heavier than in any previous month this year, and promise to be still larger in October. We quote wire nails at $1.70 per keg; cut nails $1.60 to $1.65; galvanized barb wire, per 100 lb., $2; painted, $1.70; annealed fence wire $1.50, and galvanized fence wire $1.80, f.o.b. Pittsburgh, usual terms, freight added to point of delivery. Jobbers charge the usual advances over these prices for small lots from store.

Merchant Steel.—The new demand is fairly strong. Shipments by the mills in September were heavy and will no doubt be as large in October, unless a serious shortage in cars should prevent. Makers have but little to sell for delivery this year, and most of the orders now being booked are for next year. We quote: Iron finished tire, 1½ to ⅜ in. and larger, 1.30c., base; under ⅜ in., 1.40c.; planished tire, 1.50c.; channel tire, ¾, ⅞ and 1 in., 1.80c.; 1¼ in. and larger, 1.65c.; toe calk, 1.85c., base; flat sleigh shoe, 1.35c.; concave and convex, 1.70c.; cutter shoes, tapered or bent, 2.30c.; spring steel, 1.90c.; machinery steel, smooth finish, 1.70c., all f.o.b. cars, Pittsburgh.

Merchant Pipe.—The new demand continues large, and with the mills sold up over the remainder of this year and far back in shipments jobbers are not getting deliveries wanted and there is a great scarcity in the smaller sizes of pipe in the consuming trades. The Wheeling Steel & Iron Company has taken an order for five miles of 8-in. steel pipe and has given an option to the buyer on 10 miles more at the same price. It is stated that regular discounts on both iron and steel pipe are being firmly held, and there is some talk in the trade of an early advance in steel pipe.

Boiler Tubes.—The demand for locomotive and seamless tubes is beyond all precedent, the mills being simply flooded with business. None of the makers can take on much business for this year and several are out of the market except for first quarter. Discounts on both locomotive and merchant tubes are being firmly held and the whole market is very strong.

Iron and Steel Scrap.—The heavy advances in prices of Bessemer and basic pig iron are reflected in steel making scrap. Heavy melting stock is now firmly held at $15, with sales at this price. Low phosphorus melting stock is very strong, some dealers asking $18 and refusing to sell at less. Sales have been made to a leading local consumer of 4000 to 6000 tons of selected heavy steel scrap at $16, delivered. There have also been sales of 3000 to 4000 tons of low phosphorus melting stock at $17.50 to $17.75, delivered. Borings and turnings are in fair demand, but are unchanged in price. Dealers are now quoting as follows, per gross ton:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	$15.00
No. 1 foundry cast	$13.50 to 13.75
No. 2 foundry cast	12.50 to 12.75
Bundled sheet scrap, f.o.b. consumers' mills Pittsburgh district	12.50 to 12.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	15.00 to 15.25
No. 1 railroad malleable stock	13.00 to 13.25
Grate bars	9.75 to 10.00
Low phosphorus melting stock	17.50 to 17.75
Iron car axles	24.50 to 25.00
Steel car axles	16.50 to 16.75
Locomotive axles	25.00 to 25.50
No. 1 busheling scrap	12.50 to 12.75
No. 2 busheling scrap	8.50 to 8.75
Old car wheels	14.00 to 14.25
*Cast-iron borings	10.00 to 10.25
*Machine shop turnings	11.10 to 11.25
†Sheet bar crop ends	15.00 to 15.25
Old iron rails	15.75 to 16.00
No. 1 R. R. wrought scrap	14.75 to 15.00
Heavy steel axle turnings	11.25 to 11.50
Stove plate	10.25 to 10.50

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

Coke.—The market has quieted down, but there is still a fair amount of new inquiry. One local dealer reports having bought in the past week about 40,000 tons of standard furnace coke per month for first half of 1913 delivery on which he expects to get $2.75 or better before the first of the year. A Valley furnace interest is reported to have contracted for about 14,000 tons per month over the first half of 1913 at $2.50 per net ton, at oven. Several leading makers of standard furnace coke that have not sold their output for next year are now inclined to hold off, believing they will get higher prices later on. Some rather optimistic makers believe that furnace coke will be $3 a ton before January 1. Prices on foundry coke are also very strong, the absolute minimum on standard grades of 72-hr. being $2.75, and some makers holding at $2.90 to $3, at oven. We quote standard makes of furnace coke for prompt shipment at $2.65 to $2.75 and for delivery in first half $2.50 to $2.60, at

oven. Standard makes of 72-hr. foundry coke are very strong at $2.75 to $3. The output of coke in the upper and lower Connellsville regions last week was 373,631 net tons, an increase over the previous week of 850 tons.

Chicago

CHICAGO, ILL., October 1, 1912.

The pig iron market has steadied, and buying at the higher prices now prevailing is more conservative. This is particularly pleasing to the furnace interests, who are glad to avoid the necessity of committing themselves to large tonnages at this time. The feature in pig iron is the inquiry for basic from St. Louis territory. The mill conditions as affecting the delivery of steel are rather worse than better, as specifications and new business continue to exceed shipments, September having been an especially heavy month. Orders are being placed for first quarter delivery only under pressure, though the time for regularly opening books for first quarter business is becoming more definite with some of the mills.

Pig Iron.—The most important inquiries are for basic iron from melters in the St. Louis district. They are maximum and minimum tonnage inquiries, the minimum totaling about 16,000 tons and the maximum nearly 30,000 tons. It seems certain that local furnaces at least would prefer to take orders for the minimum and it does not seem likely that the price of $17, f.o.b. Chicago furnace, will be shaded, notwithstanding that such quotation would permit a competitive price of $16 at Ohio furnace. The scarcity of basic for St. Louis delivery from Ohio and the South as well makes it seem likely that the iron will be placed at Chicago. A recent order of 10,000 tons of basic was taken by a Southern interest. The demand for malleable continues somewhat more active than for foundry. Current buying appears to be of a conservative character, the effect of the rising market as a stimulant to hasty buying having apparently passed. Minimum selling prices on Southern are 25c. higher this week, $13.50 Birmingham being the best price obtainable. First quarter business can also be placed at this figure. Prompt shipment coke is exceedingly scarce and is almost equally difficult to buy ahead. Iron ore is likewise an occasion for some concern. We quote local irons, f.o.b. furnace, the average switching charge to Chicago foundries being nearly 50c. per ton. Other quotations are for Chicago delivery. Prices on prompt shipment are as follows:

Lake Superior charcoal	$17.75 to $18.25
Northern coke foundry, No. 1	17.00 to 17.50
Northern coke foundry, No. 2	16.50 to 17.00
Northern coke foundry, No. 3	16.00 to 16.50
Northern Scotch, No. 1	17.50 to 18.00
Southern coke, No. 1 foundry and No. 1 soft	17.85 to 18.35
Southern coke, No. 2 foundry and No. 2 soft	17.35 to 17.85
Southern coke, No. 3	16.85 to 17.35
Southern coke, No. 4	16.35 to 16.85
Southern gray forge	16.10 to 16.35
Southern mottled	16.10 to 16.35
Malleable Bessemer	17.00
Standard Bessemer	17.50 to 18.00
Basic	17.00
Jackson Co. and Kentucky silvery, 6 per cent.	17.90 to 18.40
Jackson Co. and Kentucky silvery, 8 per cent.	18.90 to 19.40
Jackson Co. and Kentucky silvery, 10 per cent.	19.90 to 20.40

Rails and Track Supplies.—Recent heavy bookings of track fastenings have added considerable firmness to prices and 1.85c. is now the minimum quotation for spikes. Track bolt quotations also incline more to the maximum than minimum prices. Rail tonnage has been extensively booked and additional inquiries are under negotiation. We quote standard railroad spikes at 1.85c to 1.90c. base; track bolts with square nuts, 2.20c. to 2.30c. base, all in carload lots, Chicago; tie plates, $30 to $32.50 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Sheets.—Sheet makers announce a change in the differential between No. 28 and No. 29 galvanized sheets of 15c. instead of 10c. as formerly, and of the 20c. differential between Nos. 22 and 24 and the base size to 15c. These changes are effective at once. While Pittsburgh prices for blue annealed sheets are quoted at a maximum of 1.55c., prompt shipment sheets in this territory easily command a minimum price of 1.60c. and in some cases as high as 1.70c., Pittsburgh. We quote for Chicago delivery, in carload lots from mill, as follows: No. 28 black sheets, 2.33c.; No. 28 galvanized, 3.48c., and No. 10 blue annealed, 1.78c. to 1.88c.

The buying pressure on warehouse stocks of black and galvanized sheets continues very heavy, although the recent advance, particularly on galvanized, and the fact that sheets are somewhat easier from mill than other finished steel products have kept the volume within bound. We quote on sheets from jobbers' stocks as follows: No. 10 blue annealed, 2.15c.; No. 28 black, 2.70c., and No. 28 galvanized, 3.95c.

Bars.—Ruling prices for steel bars continue at 1.35c. to 1.40c., Pittsburgh, the latter price prevailing for all but future contract business with the leading interest. Very little if any business in bar iron is being accepted at less than 1.50c., Chicago. Specifications for both steel and iron bars during September were heavy to almost the point of being record breaking. On hard steel bars some of the local mills are sold up and on an inquiry for 700 tons one interest declined to quote. We quote for mill shipment as follows: Bar iron, 1.50c.; soft steel bars, 1.53c. to 1.65c.; hard steel bars, 1.40c. to 1.60c.

For delivery from store, we quote soft steel bars, 1.90c.; bar iron, 1.90c.; reinforcing bars, 1.90c. base with 5c. extra for twisting in sizes ¾ in. and over, and 7½c. extra for smaller sizes; shafting 57 per cent. off.

Structural Material.—Car builders are finding themselves under necessity of scouring the market for the placing of structural tonnage arising out of recent car orders. An inquiry for 18,000 tons of car shapes is a case in point the past week. The Northern Pacific is in the market for 3000 box cars and 1000 refrigerator cars. Lettings of fabricated steel were very light, totaling approximately 1000 tons, of which the American Bridge Company was awarded 498 tons for an ore dock extension at Superior, Wis., for the Soo Line and 155 tons for an office building at Gary, Ind. The National Iron Company, Duluth, will furnish 254 tons for the Duluth Curling Club, and the Northwest Steel Company 153 tons for a power house at White Salmon, Wash. We quote, for Chicago delivery, mill shipment, on plain shapes, 1.58c. to 1.68c.

Cooler weather has increased the efficiency of warehouse operations as well as those at the mills, and the delivery of structural shapes from store, cut to sizes, has been considerably improved. We quote for base sizes in store 2c.

Plates.—Some of the larger Eastern mills are now contemplating opening their books for first quarter within the next week or ten days. In view of the tremendous tonnage that will be carried over on the books into next year, practically sufficient for first quarter operations, this action on the part of the mills is not particularly significant. The Père Marquette is in the market for 50 locomotives, while the Canadian Northern and Canadian Pacific roads have placed a total of 185 locomotives with Canadian shops. We quote for Chicago delivery, mill shipment, 1.58c. to 1.68c.

Although deliveries from jobbers' stocks can now be obtained with a marked improvement in promptness, the tonnage of orders continues unabated. We quote for delivery from store, base price, 2c.

Rivets and Bolts.—Although the price of rivets has been advanced by most of the makers to the basis of 2.08c., Chicago, practically all users are under contract at lower prices, and there is apparently little business offering even at 1.98c., Chicago, which price can still be done. We quote from mill as follows: Carriage bolts up to ⅜ in. x 6 in., rolled thread, 75-10-7½; cut thread, 75-10-2½; larger sizes, 70-10; machine bolts up to ⅜ in. x 4 in., rolled thread, 75-10-10-2½; cut thread, 75-10-7½; larger sizes, 75-10-5; coach screws, 80-12½; hot pressed nuts, square head, $5.90 off per cwt.; hexagon, $6.55 off per cwt. Structural rivets, ¾ to 1¼ in., 1.98c. to 2.08c., base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Out of store we quote for structural rivets, 2.20c., and for boiler rivets, 2.30c. to 2.50c. Machine bolts up to ⅛ x 4 in., 75-5; larger sizes, 70-5; carriage bolts up to ⅜ x 6 in., 75 off; larger sizes, 70 off.

Cast Iron Pipe.—No important contracts have been closed, but the volume of small orders has been large. The tonnage for September was the largest of any month this year. Municipalities and gas companies are expected to come into the market soon, somewhat earlier than usual, owing to the fact that they will want to insure delivery at the proper time. Railroads have been making inquiries for pipe. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $30; 6 to 12 in., $28; 16 in. and up, $27, with $1 extra for gas pipe.

Wire Products.—The productive capacity of the mills is being taxed to keep up with the large volume of orders. September tonnage was the largest for the year. The demand by railroads for spikes continues to be quite pronounced. Jobbers and retail merchants are laying in large stocks of nails, wire and fencing in preparation for an increasing consumptive demand as soon as farmers have completed the labors of crop harvesting and are ready to do fall construction work. Prices are very firm as follows: Plain wire, No. 9 and coarser, base,

$1.68; wire nails, $1.88; painted barb wire, $1.88 to $1.93; galvanized, $2.18; polished staples, $1.93; galvanized $2.23, all Chicago.

Old Material.—Several railroad lists added to the available supply the past week, and, in addition, dealers are showing a disposition to move at least a part of their accumulated stocks on the rising market, which shows advances of 25c. to 50c. a ton since a week ago. The market is strongly speculative, dealers frequently paying premiums for deferred shipments of old material on the expectation of making an extra profit when delivery is finally made. The scarcity of steel rails, reported a week ago, has been slightly relieved by the offerings the past week by railroads, as follows: Chicago & Rock Island, 2700 tons, including 300 tons rerolling and 500 No. 1 railroad, closed Monday; Chicago & Northwestern, 2000 tons, which includes 400 tons of rails; Western lines of the Pennsylvania Railroad, 2500 tons, and Minneapolis, St. Paul & Sault Ste. Marie, 1600 tons, the three latter being still pending. We quote for delivery at buyer's works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.	
Old iron rails	$17.50 to $18.00
Old steel rails, rerolling	15.75 to 16.25
Old steel rails, less than 3 ft.	14.50 to 15.00
Relaying rails, standard section, subject to inspection	24.00
Old car wheels	15.50 to 16.00
Heavy melting steel scrap	13.25 to 13.75
Frogs, switches and guards, cut apart	13.25 to 13.75
Shoveling steel	13.00 to 13.50
Steel axle turnings	10.75 to 11.25

Per Net Ton.	
Iron angles and splice bars	$16.00 to $16.50
Iron arch bars and transoms	17.50 to 18.00
Steel angle bars	12.75 to 13.25
Iron car axles	22.00 to 22.50
Steel car axles	16.75 to 17.25
No. 1 railroad wrought	13.75 to 14.25
No. 2 railroad wrought	12.75 to 13.25
Cut forge	12.75 to 13.25
Steel knuckles and couplers	12.50 to 13.00
Steel springs	13.00 to 13.50
Locomotive tires, smooth	14.00 to 14.50
Machine shop turnings	8.50 to 9.00
Cast and mixed borings	7.50 to 8.00
No. 1 busheling	11.75 to 12.25
No. 2 busheling	8.75 to 9.25
No. 1 boilers, cut to sheets and rings	9.00 to 9.50
Boiler punchings	12.75 to 13.25
No. 1 cast scrap	13.75 to 14.25
Stove plate and light cast scrap	11.50 to 12.00
Railroad malleable	13.25 to 13.75
Agricultural malleable	11.50 to 12.00
Pipes and flues	10.75 to 11.25

Philadelphia

PHILADELPHIA, PA., October 1, 1912.

Pig iron prices are on a somewhat higher basis, and inquiry is still pronounced. Cast iron pipe makers are active buyers. The Pennsylvania Railroad has placed orders for a portion of its 1913 rail requirements, which, it is estimated, will aggregate from 150,000 to 175,000 tons. Basic open hearth rolling billets have been sold for first quarter at $28, delivered here. The situation in plates and shapes is unchanged, Eastern mills booking good orders at current quotations. Iron bars are gradually moving toward higher prices. The market for steel scrap is quiet.

Iron Ore.—Consumers are feeling round for further ore supplies for next year but no business of importance has been reported. Sellers have not all fixed on a price for 1913 delivery, although it is generally conceded that at least 25c. over recent quotations will be asked. Users of European ores are confronted with a scarcity of bottoms and high freights. Importations during the week include 22,600 tons from Cuba, 6376 tons from Spain, 12,555 tons from Newfoundland and 2250 tons from Venezuela.

Pig Iron.—Few sellers are offering iron for delivery over the remainder of the year. Most producers are well sold up for fourth quarter at their present basis of production, while the uncertainty as to ore, coke and labor supplies restricts the further blowing in of idle stacks and checks extensive forward selling. Pipe makers have been the most active buyers for this year's delivery. One Delaware River consumer is reported to have closed for 5000 tons, while another is still negotiating for a portion of the 10,000 tons recently inquired for. Another melter has purchased several thousand tons of Virginia iron, paying $14 at furnace for No. 3. A Virginia pipe maker has closed for 1500 tons at the same price, while inquiry for first quarter is still pending. Pipe makers have also been taking on odd lots, which, in the aggregate, reach a considerable tonnage. The recent active demand for pipe irons, as well as gray forge, has materially stiffened the market for these grades. Sales of pipe iron have been made at $16.50, delivered Delaware River points, and higher prices are now being asked. The Baldwin Locomotive Works has come out with an inquiry for 1000 to 2000 tons of foundry forge, for first quarter. Rolling mill forge is now nominally $16.50 to $16.75, delivered here. In the higher grades of foundry iron transactions have generally been in small and moderate lots for last quarter, with an occasional first quarter sale. Standard analysis No. 2 X eastern Pennsylvania foundry is now held at a minimum of $17, delivered, and few sellers will name that price, the bulk of the sales being at $17.25. A sale of a moderate lot for delivery over the next five months was made at $17.35. A sale of 1000 tons of charcoal iron, to a car wheel maker, is noted. This grade is now quoted at a minimum of $18, Buffalo. Virginia iron has been quite freely sold, both in this district and in New England, for fourth quarter, at $15, at furnace for No. 2 X and $14.75 for No. 2 plain. With the exception of the leading interest, producers refuse to quote for strictly first quarter shipment. A good share of the Virginia No. 2 X iron sold in this district was at $18, delivered. Somewhat greater activity is noted in steel making grades. A delayed report of a sale of 5000 tons of first quarter basic, made some two weeks ago at $16.25, delivered, is noted, although basic makers have since withdrawn quotations of $16.50 and now talk of $16.75 to $17 as prices at which business might be taken. One melter in this district is feeling round for both off grade and standard analysis basic for this year's delivery, while a Western consumer has an inquiry before the trade for several thousand tons. A very active demand for low phosphorus pig is noted. Makers of Lebanon Valley low phosphorus are out of the market for this year. Sales of an aggregate of 3000 to 4000 tons of standard analysis low phosphorus at prices equal to $22, delivered in this district, are reported by one seller. Prices on all grades are steadily advancing, as fast as sellers find themselves pretty well sold up, and some producers have entirely withdrawn from the market. Following is the range of quotations for fourth quarter delivery in buyers' yards in this district:

Eastern Pennsylvania No. 2 X foundry	$17.00 to $17.25
Eastern Pennsylvania No. 2 plain	16.75 to 17.00
Virginia No. 2 X foundry	17.80 to 18.00
Virginia No. 2 plain	17.55 to 17.75
Gray forge	16.50 to 16.75
Basic	16.50 to 16.75
Standard low phosphorus	22.00

Ferroalloys.—The price of 80 per cent. ferromanganese for next year's delivery is now pretty generally fixed at $59.50, seaboard, although offers are still subject to cable confirmation. Some moderate local inquiry is in hand. For prompt shipment prices continue to be marked up, and as high as $70 has been named. Fifty per cent. ferrosilicon has been advanced to $75, delivered here, small sales having been made at that basis. Prices of 10 to 12 per cent. furnace ferrosilicon are unchanged. Importations of ferromanganese at this port last week aggregated 3899 tons, practically all on contract.

Billets.—Eastern mills have entered a moderate amount of first quarter business for basic open-hearth soft steel billets at $28, delivered in this district, and a very good volume of inquiry for the delivery named is noted. Mills are practically sold up on rolling billets for this year, although several small sales at the same price have been made. A moderate amount of business for fourth quarter forging billets can still be entered by some producers, who name $32, Eastern mill, as a minimum for ordinary specifications.

Plates.—The demand for early delivery continues heavy. Consumers are also inquiring freely for forward deliveries, but little business of this character has been entered. Specifications against contracts expiring with the third quarter have been large and mill activities, while at their best, are unable to keep up with the demand. Eastern mills able to make reasonable delivery have no difficulty in obtaining 1.65c. for sheared and 1.70c. for universal plates, with $1 advance for November and $2 advance for December delivery in buyers' yards in this district.

Structural Material.—There is still an absence of any large business in this immediate vicinity, although a very good run of small lots is noted. Mills are not seeking contracts aggressively and business under negotiation develops slowly. Considerable moderate and some large apartment house construction is in sight. Several small bridge contracts are being figured on. Makers of plain material continue exceedingly busy.

New business continues to be entered freely in plain shapes at prices close to 1.65c., delivered here. Deliveries are being less freely made from mill stock, such shipments commanding from 1.80c. to 1.85c., f.o.b. mill.

Sheets.—Inquiry is, if anything, larger, but Eastern mills are well sold up and still refuse to consider business for extended shipment. Western No. 28 sheets are quoted at 2.30c. to 2.35c., delivered here, but deliveries are usually unsatisfactory to buyers. Eastern mills name 1.85c. minimum, delivered here, for blue annealed, and on lighter gauges readily obtain ½c. per lb. advance for smooth, loose-rolled sheets.

Bars.—A very good demand for iron bars is reported. Mills are becoming less anxious for business and price advances are noted. While in exceptional instances 1.40c., mill, may be done for ordinary bars, 1.45c. to 1.50c., mill, is now pretty generally quoted, equal to 1.52½c. to 1.57½c., delivered here. Steel bars are active at unchanged prices. Prompt bars are scarce, but forward bars are freely quoted at 1.50c. to 1.55c., delivered here.

Coke.—A moderate volume of business is moving in foundry grades at prices ranging from $2.75 to $3 at oven. Inquiry for forward furnace coke continues active, but offerings have not come out freely, owing to the apparently limited supply. The market is exceedingly strong at $2.40 to $2.50 at oven for first half shipment. The following range of prices, per net ton, is named for deliveries in buyers' yards in this vicinity:

Connellsville furnace coke	$4.65 to $4.95
Connellsville foundry coke	4.85 to 5.10
Mountain furnace coke	4.15 ao 4.45
Mountain foundry coke	4.50 to 4.75

Old Material.—The movement in heavy steel melting scrap continues to drag. Mills make but few purchases, although dealers are buying to cover contracts already entered. More activity is observed in rolling mill grades and slightly better prices have been obtained by some sellers. Borings, turnings and No. 1 railroad wrought have been fairly active. Sales of the last named have been made at $16.75, delivered. The following range of prices about represents the market for deliveries in buyers' yards, eastern Pennsylvania and nearby points, taking a freight rate ranging from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel scrap and crops	$14.50 to $15.00
Old steel rails, rerolling (nominal)	16.00 to 16.50
Low phosphorus heavy melting steel scrap	17.75 to 18.25
Old steel axles	18.50 to 19.00
Old iron axles	24.50 to 25.50
Old iron rails (nominal)	17.00 to 17.50
Old car axles	14.25 to 14.75
No. 1 railroad wrought	16.50 to 17.00
Wrought iron pipe	13.25 to 13.75
No. 1 forge fire	12.50 to 13.00
No. 2 light iron (nominal)	7.50 to 8.00
Wrought turnings	11.00 to 11.50
Cast borings	10.75 to 11.25
Machinery cast	14.00 to 14.50
Grate bars, railroad	11.00 to 11.50
Stove plate	11.00 to 11.50
Railroad malleable (nominal)	12.50 to 13.00

Cleveland

CLEVELAND, OHIO, October 1, 1912.

Iron Ore.—Some small lot sales have been made at an advance over current quotations, the maximum premium paid being about 35 cents. Furnacemen who will need additional ore to complete their requirements up to the opening of the next season of navigation appear willing to pay the premium. There is still some inquiry for small lots. Ore men expect that the buying movement for next season will be one of the earliest in the history of the trade. In some previous years when the condition of the steel trade was satisfactory the bulk of the sales were made before January 1, but in the past two seasons the buying movement has not started until well along in the spring. While September shipments were heavy they are not expected to equal the average of the three previous months. Shipments have been delayed by a car shortage which is still causing trouble at the upper end of the lakes and by fogs. The shipments of the Steel Corporation were not as heavy last month as in the summer and will show a considerable falling off in October. The Steel Corporation crowded shipments to the limit during the early part of the season and is now in a very satisfactory shape and plans an early closing of its movement. It has scheduled the loading of its last cargoes at the head of the lakes for November 16. Some other shippers will have all they can do to get down their ore before the close of navigation. The vessel freight market has eased up somewhat. Some wild tonnage has been chartered at an advance of 10 cents over regular rates from the head of the lakes and 15 cents from Escanaba. We quote prices as follows: Old Range Bessemer, $3.75; Mesaba Bessemer, $3.50; Old Range non-Bessemer, $3.05; Mesaba non-Bessemer, $2.85.

Pig Iron.—The market is very firm and quite active. Prices on all grades have been advanced. Some Valley makers have advanced quotations on basic to $16 and a small tonnage has been sold at that price for prompt shipment. Several inquiries are pending on which $16 has been quoted. An offer of close to $15.50 at furnace has been made for basic for delivery through the remainder of the year. Valley producers have advanced quotations on foundry iron to $16 for No. 2 and a small amount has been sold at that price. During the week a number of sales for shipment from the Valley were made at prices ranging from $15.25 to $15.75, but a leading producer has withdrawn the latter quotation. Local furnaces booked considerable business in the week. One Cleveland producer sold about 8000 tons of foundry iron, mostly for the first half for both local and outside delivery, at $16 furnace. These sales were in lots up to 1200 tons. Local furnaces are asking somewhat higher prices for Cleveland delivery, now quoting No. 2 foundry at $16 to $16.50, furnace, for such delivery. The Westinghouse Electric & Mfg. Company bought from Cleveland furnaces a round tonnage for its local plant. The American Steel Foundries has an inquiry out for 5000 to 15,000 tons of basic for its Alliance, Ohio, plant for the first quarter and first half. A St. Louis inquiry is for from 6000 to 10.000 tons of basic for the first half. Some other smaller inquiries are pending. The Andrews Steel Company, which had an inquiry out for 20,000 tons of basic, is understood to have bought at least a portion of that tonnage. A leading Southern producer has opened its books for second quarter iron at $14, Birmingham, for No. 2. For prompt shipment and for the first half we quote, delivered Cleveland, as follows:

Bessemer	$17.15 to $17.40
Basic	16.65 to 16.90
Northern No. 2 foundry	16.25 to 16.75
Southern No. 2 foundry	17.60 to 18.35
Jackson County silvery, 8 per cent. silicon	18.05

Coke.—The market is very strong. A large amount of furnace coke was sold in the week for the first half at $2.50, at oven. A Cleveland interest closed for 12,000 tons a month for the first half at that price and for a small tonnage at $2.75. The latter price is now being offered, but producers are asking $2.90. A sale of 2,000 tons of spot furnace coke was made at $3. Prices on foundry grades have been advanced to $3.25 to $3.50 for standard 72-hr. grades and some has been sold at $3.25. There is a considerable demand for foundry grades for early shipment. Owing to car shortage sellers are not promising box cars for foundry coke shipments.

Finished Iron and Steel.—There is a great deal of inquiry for contracts for steel bars, plates and shapes for the first quarter and first half, but mill agencies generally are avoiding as much as possible the taking of contracts. Some of the independent producers have enough business on their books to keep their mills running through the first quarter and are taking no new contracts whatever. Some first quarter tonnage has been booked at 1.40c. for bars and 1.45c. to 1.50c. for plates and shapes. Sellers have no difficulty in getting these advances over regular quotations. Specifications are heavy and mill deliveries show no improvement. An Eastern mill which has been selling structural material in this market at 1.40c., mill, for delivery within the next few weeks, has advanced its price to 1.45c., and is getting 1.50c. for prompt shipment. Eastern mills continue to quote plates at 1.50c. at mill for Western shipment. While not much new inquiry for large tonnage is coming out the demand for structural material is heavy and deliveries are getting worse. Local fabricating shops are filled with work. Bar iron is firm at 1.50c., Cleveland, and local mills have nothing to offer for this year's delivery. The Lake Shore Railroad is understood to have succeeded in covering for 3000 tons of iron bars for the first quarter. The demand for sheets is active and prices are being maintained. Rivets are firm, but prices have not been advanced. Local warehouses are getting a heavy volume of orders.

Old Material.—The market is very firm and more active than for some time. Some sales for prompt shipment were made during the week at higher prices than have prevailed recently. Two local mills are in the market for a round tonnage of steel making scrap for November and December delivery. There is considerable inquiry from Valley mills. The Lake Shore Railroad re-

ceived bids Monday on its scrap list and the Erie Railroad Tuesday. The Pennsylvania Railroad list will close Wednesday and the list of the Pennsylvania Lines West Thursday. Dealers' prices, f.o.b. Cleveland, are as follows:

Per Gross Ton.

Old steel rails, rerolling	$14.50 to $15.00
Old iron rails	14.50 to 15.00
Steel car axles	18.50 to 19.00
Heavy melting steel	13.25 to 13.50
Old car wheels	13.50 to 14.00
Relaying rails, 50 lb. and over	22.00 to 22.50
Agricultural malleable	11.00 to 11.50
Railroad malleable	13.25 to 13.50
Light bundled sheet scrap	10.00 to 10.50

Per Net Ton.

Iron car axles	$20 00 to $21.00
Cast borings	7.50 to 7.75
Iron and steel turnings and drillings	8 00 to 8.25
Steel axle turnings	8.50 to 8.75
No. 1 busheling	11.50 to 12 00
No. 1 railroad wrought	13.00 to 13.50
No. 1 cast	12.25 to 12.75
Stove plate	9.50 to 10 00
Bundled tin scrap	11.00 to 11.50

Cincinnati

CINCINNATI, OHIO, October 2, 1912.—(*By Telegraph.*)

Pig Iron.—The majority of consumers in this territory have covered for their fourth quarter requirements, although there are a few straggling orders from nearby foundries for prompt shipment iron, and there has been considerable quiet buying, mainly through traveling salesmen, for first and second quarter of next year. The furnaces have apparently a firm hold on the situation, as many in both the Ironton and Southern districts will have considerable trouble in taking care of old customers throughout the remainder of the present year on orders heretofore booked. Advances have been made by both Southern and Northern producers, although our quotation of $15.50, Ironton, on Northern No. 2 foundry can be shaded on a small quantity of resale iron for this year's shipment. Quite a number of both Southern and Northern furnaces refuse to quote for the second quarter of next year, but first quarter prices on Southern No. 2 foundry range from $13.50 to $14, Birmingham basis. A Michigan manufacturer is in the market for from 1000 to 2000 tons of Southern foundry, and an Indiana melter will soon close for 1000 tons of Northern No. 2 foundry, both for first half shipment. The demand for malleable is quieter, but small tonnages of the high silvery irons make a better showing. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft	$16.75
Southern coke, No. 2 foundry and 2 soft	16.50
Southern coke, No. 3 foundry	16.25
Southern coke, No. 4 foundry	16.00
Southern gray forge	15.75
Ohio silvery, 8 per cent. silicon	$17.70 to 18.20
Southern Ohio coke, No. 1	17.20
Southern Ohio coke, No. 2	16.70
Southern Ohio coke, No. 3	16.45
Southern Ohio malleable Bessemer	16 20
Basic, Northern	16.70
Lake Superior charcoal	17.50
Standard Southern car wheel	25.75 to 26.00

(By Mail)

Coke.—Prices in all three districts continue to climb. In the Connellsville field $2.50 is now minimum on 48-hr. coke, and it would be an extremely difficult proposition to purchase more than a few carloads at this figure. Some spot furnace coke has sold as high as $2.75, and operators are not very anxious to take on much future delivery business at any figure. Wise county producers are able to shade Connellsville quotations about 10c. a ton, but the labor shortage in that district is becoming more acute and advances are expected soon. In the Pocahontas field operators are reluctant to accept any large orders, but furnace brands are obtainable around $2.35 to $2.55 per net ton, at oven. Foundry coke has also taken on a stiff advance, and while a small quantity of Wise County and Pocahontas 72-hr. brands is quoted around $2.90 for this year the majority of producers are following the lead of Connellsville operators and are holding out for $3 to $3.25 per net ton, at oven. The car shortage situation is gradually becoming worse, and coupled with the scarcity of labor has originated a great deal of complaint from consumers who had previously signed up for a future supply.

Finished Material.—In company with about 11 other independent mills throughout the country, the local manufacturer of sheets is now maintaining a differential of 15c. per 100 lb. between Nos. 28 and 29 gauges of galvanized sheets. Formerly the difference was only 10c., and in a few cases the mills made the same price on both gauges. A careful investigation of manufacturing costs has convinced them that the differential of 15c. was necessary, and quotations to agents and jobbers will, hereafter, be made on this basis. We quote No. 28 galvanized sheets firm at 3.30c., Pittsburgh basis. Structural material is hard to obtain for this year's shipment, and a large percentage of business taken is only accepted after referring the inquiry to the head office. Steel bars are quoted at 1.35c., Pittsburgh basis, and structural material around 1.45c.

Old Material.—The inquiry for many grades of scrap is excellent, and there has been a further advance in prices. The rolling mills are not the only customers, as the foundry business has improved considerably within the past few days. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	$10.50 to $11.00
Old iron rails	14.25 to 14.75
Relaying rails, 50 lb. and up	21.75 to 22.75
Rerolling steel rails	12.25 to 12.75
Melting steel rails	11.50 to 12.00
Old car wheels	13.00 to 13.50

Per Net Ton.

No. 1 railroad wrought	$11.75 to $12.25
Cast borings	7.25 to 7.75
Steel turnings	8 00 to 8.50
No. 1 cast scrap	11.00 to 11.50
Burnt scrap	7.75 to 8 25
Old iron axles	18.25 to 18 75
Locomotive tires (smooth inside)	12.00 to 12.50
Pipes and flues	7.75 to 8.25
Malleable scrap	9.50 to 10.00
Railroad tank and sheet scrap	7.25 to 7.75

St. Louis

ST. LOUIS, MO., September 30, 1912

The features of the past week have been the sudden and sharp renewal of the buying movement which, it was thought, had been checked by the filling of requirements and the high prices, and the sharp shortage in cars which is interfering severely with the deliveries already extended beyond expected limits. These facts coupled with the labor shortage are presenting difficulties which even premiums will not overcome.

Pig Iron.—A sharp demand, regardless of prices, was apparent all the week. No general advances of prices were noted, but some furnaces are advising representatives not to be too eager to close contracts at present quotations, while a few are adding 50c. per ton to their prices. Among the contracts closed were one of 800 tons to Quincy, Ill., stove interests, of Northern iron, and 1000 tons of the same grade to other founders. In Lake Superior charcoal iron there were sales of 500 tons and of 1000 tons; also a sale of 500 tons of Southern coking iron on what amounts to a No. 2 foundry analysis. A large steel foundry took 500 tons of ferrosilicon running 12 to 13 per cent. silicon. Another large foundry took 15,000 tons of Southern basic and the same interest also took 10,000 tons of Northern basic. Inquiries in the market include a large number for small tonnages, with the total running to big figures, while a steel founder is in the market for 10,000 tons of basic with the likelihood that the final order will run anywhere from that figure to 25,000 tons if the offerings are satisfactory. The small melters are in the market as strongly as ever and the activity in this market has never been greater since the present movement began. Urgent requests for deliveries are numerous. The car shortage is leading to the use of every type of rolling stock available.

Coke.—The stiffening of the coke prices here continues, labor shortage and car shortage having an influence. One representative reports a shortage of 6000 tons in its deliveries on existing contracts. There is no change in by-product figures. The coke contracts of the week have been fair in the aggregate, but none of them have been for very large amounts, the difficulty of delivery interfering in closing.

Finished Iron and Steel.—Reports are that the unfilled orders show an increase over those on the books at the first of September. As high as $3 per ton premium is reported to gain 30 days' delivery. In standard section steel rails the only sale of the week was of 5500 tons for the Cotton Belt, the greater portion for 1912 delivery. The roads recently buying about 30,000 tons for 1913 delivery are still feeling out the market. Track fastenings are in sharp demand with deliveries still further spread. In structural steel customers are urging delivery of material which they did not antici-

pate wanting before next March. Light rails are in excellent demand from both the coal and the lumber interests with prospects of an advance in prices. February is about the earliest date to get plates. Bars are in active request from the agricultural machinery and the wagon interests.

Old Material.—The scrap market continues to advance. The renewed demand for pig iron has also affected the demand for scrap cast iron and for steel products as well. Mills and foundries are both actively in the market. Relaying rails are very strong, both standard and light, while the supply is very low. No lists of importance came out, this being the last week of the month. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.

Old iron rails	$15.50 to $16.00
Old steel rails, re-rolling	13.75 to 14.25
Old steel rails, less than 3 ft.	14.50 to 15.00
Relaying rails, standard section, subject to inspection	23.50 to 24.00
Old car wheels	15.50 to 16.00
Heavy melting steel scrap	14.00 to 14.50
Frogs, switches and guards cut apart	14.00 to 14.50

Per Net Ton.

Iron fish plates	$13.00 to $13.50
Iron car axles	19.50 to 20.00
Steel car axles	17.50 to 18.00
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	12.00 to 12.50
Railway springs	11.00 to 11.50
Locomotive tires, smooth	13.50 to 14.00
No. 1 dealers' forge	9.00 to 9.50
Mixed borings	8.00 to 8.50
No. 1 busheling	11.00 to 11.50
No. 1 boilers, cut to sheets and rings	8.00 to 8.50
No. 1 cast scrap	12.25 to 12.75
Stove plate and light cast scrap	9.00 to 9.50
Railroad malleable	11.00 to 11.50
Agricultural malleable	10.00 to 10.50
Pipes and flues	9.00 to 9.50
Railroad sheet and tank scrap	9.00 to 9.50
Railroad grate bars	9.25 to 9.75
Machine shop turnings	9.00 to 9.50

San Francisco

SAN FRANCISCO, CAL., September 24, 1912.

The consuming demand for most finished materials continues on about the same scale as last month, and merchants generally are suffering some inconvenience from the depletion of stocks. Specifications are now going in for the remainder of the material secured by third-quarter contracts, and many mill agents have booked about all the business they can take for the fourth quarter, considerable business being taken at a premium over the established quotations. Sellers are conservative regarding orders for 1913 delivery, but some sales have been made, and merchants show an increasing desire to provide for future requirements. Jobbing prices continue to advance in sympathy with Eastern markets. Perhaps the most interesting development of the last fortnight is the placing of large orders for welded high-pressure pipe of German manufacture.

Bars.—Several mills are practically out of the market, refusing most of the business offered them. Prices show considerable variation. It is reported that recent offers of hard steel reinforcing bars have been made as low as 1.85 c., but most mills which can make early delivery of either hard or soft steel bars are getting much higher figures. The largest requirements of reinforcing bars for this season have been covered, but small inquiries continue very numerous. Specifications for soft steel bars are coming out in large volume from merchants and consumers, and most stocks are considerably broken. Jobbing prices on bars, from store, San Francisco, are 2.55 c. for soft steel and 2.45 c. for iron.

Structural Material.—Eastern fabricators show less anxiety for business in this territory than for some time, and as coast shops have the facilities they are expected to take most of the contracts let in the near future. An unusual feature is the figuring of work in Portland, Ore., by San Francisco shops, while considerable inquiry is coming from smaller towns. The largest work in immediate prospect locally has been provided for, but small jobs are numerous. Additional harbor work will be in the market before long. The Ralston Iron Works has a small contract for the Clark Hotel, Stockton, Cal., and recent contracts taken by Dyer Bros. include small jobs on the Druids' Hall and the General Electric repair shop, and 200 tons for the Great Western Power Company. The Southern Pacific Railroad is planning to build a small steel bridge in this city. A contract will probably be let next month for the 14-story building of the Pacific Telephone & Telegraph Company at Portland, Ore., now figuring, and for the Travelers' Hotel, that city, requiring about 600 tons. Bids have just been opened on a large municipal grandstand at Los Angeles. The State Armory and the Charles Barton building in that city will be figured shortly. Bids are being taken on the L. T. Thompson building, Oakland, a Masonic temple at Watsonville, Cal., and a court house at Klamath Falls, Ore., requiring approximately 200 tons each.

Rails.—No large orders have been placed here in the last fortnight, though a fair volume of routine business is reported, and plans for further development indicate an active movement next year. Some good-sized construction contracts are also being let for logging roads in the north coast States, and a great deal of development in this line is assured if the present activity in the lumber market continues. The United States Steel Products Company has a contract for additional special track connections and tubular poles for the Geary street railroad.

Sheets.—The jobbing demand for galvanized sheets is especially strong at the moment, and supplies in store are rapidly diminishing. Both jobbers and manufacturers are specifying heavily, and a good volume of fourth-quarter business is coming out, though so far little has been done on first-quarter delivery.

Plates.—The tonnage in view for penstock work has been reduced by the placing of contracts for welded pipe. Several large inquiries are in prospect, however, and the city of Los Angeles will take bids October 15 for steel and rivets for the San Fernando siphon. The Pacific Gas & Electric Company is preparing to build a new gas works at Woodland, Cal., and a new oil refinery is projected at Tulare, Cal. The jobbing demand is fairly active, and prices from store are steadily advancing.

Merchant Pipe.—A contract for about 2000 tons of high-pressure welded pipe for the San Francisquito municipal power plant of Los Angeles has been placed with German manufacturers. The diameter varies from 54 in. to 7 ft. The same manufacturers have taken a contract for about 3500 tons of similar pipe for the Pacific Light & Power Company's penstock. Business in the oil fields is limited to ordinary routine requirements, but the consuming demand for small merchant pipe is extremely active through the interior, and above the recent average locally. Stocks are considerably broken, and merchants are endeavoring to place orders covering the remainder of the year and are rapidly cleaning up their third-quarter contracts, but few if any mill agents are soliciting new business.

Cast Iron Pipe.—Many water and gas corporations are now buying small amounts for their fall repair work, and municipal inquiries are increasing, with prospects for a heavy tonnage in the fourth quarter. James W. Blair, representing Alabama and Virginia foundries, has taken an order for 850 tons for Weiser, Idaho, and the United States Pipe Company has sold a lot of 4 and 8-in. pipe to the town of Santa Barbara, Cal. The city of Los Angeles has taken figures on over 5000 tons, and the city of San Diego is expected to be in the market next month for about the same amount. An inquiry is also expected shortly from El Centro, Cal. Municipal inquiries are also fairly numerous in the north coast States. Prices f.o.b. San Francisco are $36 per net ton for 6 to 8-in. pipe and $38 for 4-in.

Pig Iron.—While local foundry conditions have improved somewhat, the market is still well supplied with foreign iron, another cargo having arrived last week at Portland, Ore. Melters are accordingly holding off, only a few cars of Southern iron having been sold lately. The increasing firmness has not yet brought out any important inquiry for first-quarter delivery. No. 2 Southern foundry iron is quoted at $23.60 and English iron at about $24.

Coke.—The current market on foundry coke is $15 prompt and $12.50 to arrive.

Old Material—Most lines of scrap are strong, with increasing activity. Foundries are buying more cast scrap than for several months, and values are higher. Coast firms are begininng to come into the market for steel melting scrap, and rails for both rerolling and relaying are in strong demand. Arrangements have been made to ship about 3000 tons of rail melting scrap to Europe. Second-hand pipe is also in fair demand, and dealers expect to dispose of a large accumulation within the next month. Prices are quoted as follows: Cast iron scrap, per net ton, $15; steel melting scrap, per gross ton, $12.50; wrought scrap, per net ton, $12.50 to $15; rerolling rails, per net ton, $11; relaying rails, 50 lbs. and over, per gross ton, $35.

German Market Conditions Still Strong

BERLIN, September 19, 1912.

The market news is all of a favorable character. This is particularly the case with bars, in which a decided increase in the buying demand is reported, especially from the export trade. Hamburg, Brussels and Antwerp exporting houses are reported as having placed large orders for 1913 delivery with mills in the Rhenish-Westphalian district. Heavy buying for the first half of next year is mentioned in the trade reports. Some buying on supplementary orders for 1912 delivery continues and in such cases consumers are often willing to pay 2 or 3 marks premium per ton for prompt delivery. Specifications are coming in on bar orders at a quite unusual pace and often with great urgency; but mills can seldom agree to make delivery under six to eight weeks. Bars for export have risen to 122 marks f.o.b. seaport and merchant pipe has been further advanced through a curtailment of the rebate by ½ per cent.

Consumers Urge Deliveries on Contracts

The pig-iron market remains rather quiet. Business for 1913 delivery has not yet been declared open, though considerable selling for export is going on. The Pig Iron Syndicate has grown very exacting about selling for delivery in the December quarter, buyers being compelled to give proof that the iron ordered is for actual consumption before the end of the year. It continues to be reported that an advance of 2 or 3 marks per ton will be provided for in the new schedule of prices. This seems to be a certainty for Luxemburg-Lorraine brands. From that district it is reported that calls for shipment on contracts are extraordinarily urgent and that pig continues scarce despite the fact that several furnaces were blown in there within the past two or three months. It is mentioned that three further furnaces will begin producing soon.

Steel mills continue to run at their utmost capacity and consumers still complain of their inability to obtain supplies promptly. Considerable buying for the next quarter is mentioned after consumers had, as was thought, already covered their full requirements. The Steel Works Union continues to be in a position to allot to the works orders in excess of their quotas. From the Luxemburg-Lorraine district it is reported that manufacturers of half-finished material are simply overwhelmed with specifications. The Union continues to get foreign orders for steel rails and foreign business in structural shapes is still excellent, fairly counterbalancing the slackness in home orders.

There is a steady run of orders in heavy plates and it is not improbable that these will even gain in volume, since shipyards continue to get orders for new vessels. Calls for delivery of heavy plates are frequently of a very urgent character. The foreign demand for thin sizes has recently improved considerably, and home business is also better. Work on bands is proceeding at the brisk pace previously reported; an advance of export prices by 1 to 2 shillings has recently been made. The tube works continue very busy and are now earning better profits through the recent advance in prices.

The Foundry Trade Improving

A report on the state of business with the foundry industry shows steady improvement in two months. It is now everywhere agreed that the backset in business that was looked for in the early summer has not been realized and all fears in that direction have been dissipated. The various groups of foundries have been rapidly advancing prices to get them more in harmony with pig-iron prices and they have been able to put the new prices in force without difficulty. The foundries are pretty generally complaining of the difficulty experienced in getting their supplies of iron on time; the delay has in many cases prevented them from filling orders promptly.

A good indicator of conditions in the iron trade is found in the fact that the Coal Syndicate has just raised the production of coke for October to 82 per cent. of total allotments, which compares with 75 per cent. for September. The October percentage is the highest of the year, with the single exception of April. A year ago the percentage was only 60 per cent. The October coal percentage was raised to 100, as against 97.50 per cent. at present and 87.50 a year ago.

The Steel Works Union has decided to establish an agency at Antwerp to look after the shipment of its products as well as pushing foreign sales. The agent will also act for the big manufacturing companies in handling products not covered by the Union so far as these wish its services.

Belgium again sends in news of advancing prices. At the end of last week a Brussels dispatch mentioned an advance of the home market price for basic steel plates of 5 francs, now 175 to 180 francs, and basic and iron bars 2.50 francs, now 157.50 to 160 francs for the former and 162.50 to 165 francs for the latter.

British Pig Iron Prices Again Decline

The Pronounced Scarcity of Ferromanganese — Steel Rails Higher

(*By Cable*)

MIDDLESBROUGH, ENGLAND, October 2, 1912.

There are numerous inquiries for ferromanganese and some makers will not quote c. i. f. The prices asked are £11 5s. f.o.b. makers' works, and even £11 10s. f.o.b. Renewed influential buying has strengthened pig iron, but quotations are slightly lower than last week. American quotations for semi-finished material are prohibitive and the fair demand is being met by the German Steel Works Union at full prices. The stocks of pig iron in store are 276,471 tons, against 278,019 tons last week. We quote as follows:

Cleveland pig iron warrants (closing Tuesday), 66s. 7d., against 66s. 9d. one week ago.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 67s. 3d., against 67d. 6d. one week ago.

Steel sheet bars (Welsh) delivered at works in Swansea Valley, £5 17s. 6d. for January-March delivery.

German sheet bars, f.o.b. Antwerp, 110s.

German 2-in. billets, f.o.b. Antwerp, 104s.

German basic steel bars, f.o.b. Antwerp, £6 4s.

Steel bars, export, f.o.b. Clyde, £7 15s. to £7 17s. 6d.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £7 5s. nominal.

German joists, f.o.b. Antwerp, £5 12s. to £5 15s.

Steel ship plates, Scotch, delivered local yard, £8 2s. 6d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 15s.

Steel rails, export, f.o.b. works port, £6 12s. 6d., an advance of 5s. from last week.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 15s. 4½d.

New York

NEW YORK, October 2, 1912.

Pig Iron.—Local offices report a week of fair sales, but there has been no noteworthy buying on inquiry developed in the week. Considerable of the latest business has been with New York State foundries, the situation in New England being rather quiet. There is not the close competition that characterized the market in early September, the disposition on the part of most furnaces being to hold off, with the expectation of realizing the prices they have recently quoted. September buying has amounted to a large total, one important selling firm having made in the total for all its offices a greater record than in August, which was the previous record. Buffalo furnaces have done some further business with Canada and more is pending with foundries there. Eastern Pennsylvania furnaces seem to be on a $16.50 basis at furnace for No. 2 X and one interest has asked $16.75 in the past week for delivery in 1913. Buffalo furnaces are able to offer little for this year and some are entirely out of the market for such delivery. Sales of pipe iron have been made both to Virginia and to Delaware River producers, these including some Southern iron to points reached by water. Virginia furnaces are holding for higher prices, the leading interest there now asking $15 for 1913 delivery of No. 2 X, with a 25-cent differential on lower grades instead of 50 cents, as heretofore. This company is out of the market for this year. The pig iron sales of one local office were 12,000 to 15,000 tons last week. With other sellers business has been lighter, but some fairly large inquiries are pending. The influence upon the Eastern market of the recent advances in steel-making pig iron in the Central West and the knowledge that stocks have been declining, together with the well sold condition of a number of furnace companies, particularly in the Buffalo district, have given a very firm tone to the market. Charcoal iron

has advanced and the basis of one large Michigan interest is now $18.75 at Buffalo, representing an advance of 75 cents in the past week following an advance of 50 cents in the week preceding. We quote as follows for Northern iron at tidewater: No. 1 foundry, $17.25 to $17.50; No. 2 X, $17 to $17.25; No. 2 plain, $16.75 to $17. Southern iron is quoted at $17.50 to $17.75 for No. 1 foundry and $17.25 to $17.50 for No. 2.

Structural Material.—Contracts for plain material for the first quarter of next year appear to go at prices dependent on the resourcefulness of the buyer. A range in prices of $2 a ton has been learned of for this business with the indications that the minimum and maximum are 1.35c. and 1.45c. Pittsburgh, respectively. The figure of 1.40c. Pittsburgh for the remainder of the year is more or less nominal, no business of large proportions being reported at this price, but instead increases being obtained according to quantity and urgency. There is very little railroad work pending worthy of comment and none in sight; several hundred tons will cover the requirements of the railroads in the East, and over 90 per cent. of this is probably for jobs of less than 50 tons each. While this condition is expected at this time of the year, some surprise is expressed that no attempt is made to anticipate needs in view of mill conditions. One interesting development is the award to the Owego Bridge Company of the 7800-ton structure for the Eighth Coast Artillery armory. The lowest of the four alternate bids submitted by the company was $528,000, a figure over $25,000 higher than what the 8000 tons of the earlier plans would have cost had the award been made some months ago when the bids were rejected on account of cost. The revision of the plans has accordingly cost both time and money. The largest railroad project closed is the station and accompanying viaduct at Lynn, Mass., for the Boston & Maine, 1400 tons, given to the Boston Bridge Works. Another railroad award is 200 tons, for a bridge for the New York Central at Ossining, N. Y., to Lewis F. Shoemaker & Co. Other awards include: Garage for the Masqn-Seaman Transportation Company, 600 tons, a large part to consist of cast-iron columns, to Mulcahy & Gibson; apartment house, Eighty-seventh street and Central Park West, 550 tons, to A. E. Norton Company, and school of dentistry, University of Pennsylvania, 500 tons, to American Bridge Company. It is reported that shipments of one interest from store aggregate 1000 tons daily. Additional work still pending covers a 200-ton highway bridge for the Baltimore & Ohio, which is also in the market for 100 tons in the Chicago territory; 300 tons terminal area work for the New York Central; 250 tons for the New Haven at Woonsocket, and 250 tons for the Boston & Maine at Somerville. It is estimated that the structural work for buildings in the Panama Canal zone, at Balboa, which bids are advertised, will amount to 3500 tons. We quote plain material at 1.56c. to 1.61c., New York, mill shipments, and 2.15c. from store.

Steel Plates.—There are 16,000 to 17,000 steel cars pending in the market, a fact that is regarded as clearly indicating how little the national elections, only one month removed, are affecting business. A large boiler manufacturer has not, at this writing, succeeded in getting quotations on several thousand tons for delivery during the first half, and sellers are in such a strong position that no concessions in price are expected. Deliveries have not been bettered and inquirers for the rest of the year have been told they must pay $1 a ton more for November and $2 more for December. Local business has not, however, improved, and in fact is experiencing the usual dullness of the season. The list of railroad car business not yet placed is as follows: Chicago, Burlington & Quincy, 500 flat cars, 10 mail and baggage, etc.; San Pedro, Los Angeles & Salt Lake, 200 to 300 box; Missouri, Kansas & Texas, 2000; Northern Pacific, 3000 box and 1500 refrigerator; Kansas City Southern, 1000 gondola, 200 flat, 100 automobile; Pennsylvania, 4000 box, 1000 automobile; Erie, 2000 box; Chicago Northwestern, 2000 gondola, box and flat and said to be considering the purchase of center construction; Baltimore & Ohio, center construction for 1000 existing cars, and Harriman Lines, 80 electric motor cars and trailers, for suburban service. We quote sheared plates at 1.56c. to 1.66c. New York, and universal plates at 1.61c. to 1.71c.

Iron and Steel Bars.—Steel bars quite generally sold up for this year, and with some companies even for the first quarter; steel bars quoted at 1.40c. Pittsburgh for second quarter; iron bars still in great demand and an advance on them of $1 a ton by a large producer on Saturday—these conditions describe the great strength of the bar market. Deliveries of steel bars of popular sizes are matters of months hence and so great is the volume of business of the bar iron interest which has made its price 1.55c. New York that it suggests it may be forced to make still a further advance. A request of a New York general contractor for 2000 tons of reinforcing bars for shipment to Manchester, England, presumably for as early delivery as possible, has not at this writing even been considered. We quote steel bars at 1.51c. to 1.56c., New York, mill shipment and from store, 2c.; iron bars, 1.50c. to 1.55c., New York, and from store, 1.90c.

Cast Iron Pipe.—The city of Jamestown, N. Y., will open bids Friday, October 4, on 850 tons of water pipe, all 16's and 24's; Portsmouth, Va., October 15, 9700 tons of 4's to 24's. The general demand continues active with a persistent tendency toward the smaller sizes. Some foundries are so completely sold up on such sizes that deliveries cannot be promised until December. Prices are higher, partly because of the strong demand and partly due to the higher cost of pig iron. Carload lots of 6 in. are quoted at $24.50 to $26 per net ton, tidewater, according to the condition of order books.

Old Material.—Some demand is experienced for heavy melting steel scrap, but the usual monthly railroad lists are out this week, and as the leading consumers desire to see the outcome of their bids on the material in these lists they will naturally hesitate to make offers to dealers. A feature of the present condition of trade is that the foundries appear to be getting busier. A demand is beginning to spring up for cast scrap, and in this line every day shows some improvement. It is understood that large manufacturers of pumping machinery are in the market for cast scrap. Old car wheels are more active and higher. Relaying rails are in better demand because of the inability of the rail mills to furnish new rails as rapidly as desired for renewals. The market is strong throughout, with a decided tendency toward higher prices. Dealers' quotations, per gross ton, New York and vicinity, are as follows:

Old girder and T rails for melting	$12.00 to $12.50
Heavy melting steel scrap	12.00 to 12.50
Relaying rails	22.00 to 22.50
Rerolling rails	14.00 to 14.50
Iron car axles	22.50 to 23.00
Old steel car axles	16.50 to 17.00
No. 1 railroad wrought	13.75 to 14.25
Wrought iron track scrap	13.00 to 13.50
No. 1 yard wrought, long	12.50 to 13.00
No. 1 yard wrought, short	12.00 to 12.50
Light iron	5.25 to 5.50
Cast borings	7.75 to 8.00
Wrought turnings	9.00 to 9.25
Wrought pipe	11.50 to 12.00
Old car wheels	14.00 to 14.50
No. 1 heavy cast, broken up	12.50 to 13.00
Stove plate	10.00 to 10.25
Locomotive grate bars	9.50 to 9.75
Malleable cast	10.50 to 11.00

Ferroalloys.—The most notable feature of the present situation in ferromanganese is that representatives of some English producers have been notified that they will not quote for future delivery. Ferromanganese, 80 per cent., can be bought at $59.50 to $60, Baltimore, for next year's delivery and spot continues to be held at $65. Last week the market was lively and at least 5000 tons was sold for next year, some of it into the last half. There are still noteworthy requirements to be cared for, and these will run into exceptionally heavy tonnage if present conditions continue. For 50 per cent. ferrosilicon the quotations are $75, Pittsburgh, for carload lots, $74 for 100 tons and $73 for 600 tons and up. The market has been quiet.

Buffalo

BUFFALO, N. Y., October 1, 1912.

Pig Iron.—New placement has totaled less than for the previous week but will aggregate about 30,000 tons, all grades. Specifications and shipments on contracts continue to be very heavy with fair inquiry still coming in both for current quarter and first half delivery. Producers are not seeking business and reliable estimates show that at least 95 per cent. of the output of furnaces in this district to January 1 has been sold and fully 75 to 80 per cent. of capacity production to July 1. Some producers are entirely out of the market on malleable until July 1, being sold up to that date. Although prices are very strong and most grades have been further advanced, there are no signs of excitement or undue haste to cover unsatisfied requirements. There is, however, a large consuming capacity that is apparently not covered for first half requirements. Furnacemen are experiencing no difficulty in disposing of all the iron which they have to offer at the advanced schedules and

are absolutely rigid in their quotations. For first half delivery we quote as follows, f.o.b. Buffalo:

No. 1 foundry	$16.50 to $17.00
No. 2 X foundry	16.25 to 16.75
No. 2 plain	16.00 to 16.25
No. 3 foundry	15.75 to 16.00
Gray forge	15.75 to 16.00
Malleable	16.25 to 16.75
Basic	16.50 to 17.00
Charcoal, regular brand and analysis	18.75 to 21.25
Charcoal, special brand and analysis	22.00

Coke.—An advance of 10 per cent. has been made in price within the past two or three days, owing to scarcity, and many foundries are badly crippled on account of their inability to obtain sufficient supplies.

Finished Iron and Steel.—The ability of mills to meet urgent specification demand is becoming more curtailed, owing to the filled to overflowing condition of order books, as consumers are specifying the maximum of tonnage covered by contracts. Offerings of new business are larger than mills can possibly care for. In fact most mills are unable to accept further business for first quarter on account of their sold-up condition, and warehouse stocks are becoming much depleted as regards many sizes. Prices are rigid at 1.35c. Pittsburgh, for bar material, and 1.45c. for plates and shapes. One interest is declining all business under 1.40c. and 1.50c., respectively, and a further advance of at least $1 per ton is anticipated, to take effect before the end of the month. Cold rolled steel has advanced $3 a ton. Business in wire products has been very active, with prices holding firmly at $1.50 on wire and $1.70 on nails, deliveries being from 30 to 60 days behind. In structural material a large tonnage in small lot orders is coming in. Larger tonnage orders are retarded for the present owing to inability to secure deliveries for the current building season. February and March deliveries are the earliest now obtainable. It is understood that the American Bridge Company has received the contract through its Buffalo office for the 1000 tons of steel for the State Normal School at Buffalo. The Charles F. Ernst & Sons Iron Works has received the contract for the Main Street Realty Company's building at Main and Best streets, Buffalo, taking 150 tons. The contract for the steel for the George Tett Brewing Company's building, Syracuse, about 100 tons, went to the Syracuse Bridge Company and the steel work for a machine shop for H. G. Hammett, Troy, N. Y., about 200 tons, went to the Mahoney Mfg. Company, Troy.

Old Material.—The market is much more active than for some time past, with good demand from local mills and foundries as well as from outside districts. Transactions have been of good volume at prices somewhat higher than obtained last week. We quote as follows per gross ton f.o.b. Buffalo:

Heavy melting steel	$14.25 to $14.50
Low phosphorus steel	16.75 to 17.25
No. 1 railroad wrought	14.00 to 14.50
No. 1 railroad and machinery cast scrap	14.00 to 14.50
Old steel axles	16.00 to 16.75
Old iron axles	23.25 to 23.75
Old car wheels	14.75 to 15.25
Railroad malleable	13.25 to 13.75
Boiler plate, sheared	14.50 to 15.25
Locomotive grate bars	11.75 to 12.25
Wrought pipe	10.25 to 10.75
Tank iron	10.50 to 11.00
Wrought iron and soft steel turnings	8.75 to 9.00
Clean cast borings	8.00 to 8.50

Boston

BOSTON, MASS., October 1, 1912.

Old Material.—The market is steady, with little change in general conditions, and none in prices. The quotations given below are of prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points, taking Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	$11.75 to $12.00
Low phosphorus steel	13.50 to 14.00
Old steel axles	14.50 to 15.00
Old iron axles	22.00 to 22.50
Mixed shafting	14.00 to 14.50
No. 1 wrought and soft steel	11.50 to 11.75
Skeleton (bundled)	10.00 to 10.50
Wrought iron pipe	10.00 to 10.25
Cotton ties (bundled)	10.25 to 10.75
No. 2 light	4.50 to 5.00
Wrought turnings	8.00 to 8.50
Cast borings	7.50 to 7.75
Machinery, cast	12.50 to 13.00
Malleable	10.00 to 10.50
Grate bars	7.75 to 8.00
Stove plate	8.50 to 9.00
Cast-iron car wheels	12.50 to 13.00

Metal Market

NEW YORK, October 2, 1912.

The Week's Prices

Cents per Pound for Early Delivery

	Copper, New York.			Lead		Spelter	
Sept.	Lake.	Electrolytic.	Tin, New York.	New York.	St. Louis.	New York.	St. Louis.
26	17.75	17.70	50.90	5.10	4.95	7.65	7.50
27	17.87½	17.70	50.80	5.10	4.95	7.65	7.50
28	17.87½	17.70	.....	5.10	4.95	7.65	7.50
30	17.87½	17.70	51.00	5.10	4.95	7.65	7.50
Oct							
1	17.87½	17.70	50.20	5.10	4.95	7.65	7.50
2	17.87½	17.70	50.25	5.10	4.95	7.65	7.50

Copper buying has been steady, and prices remain very strong despite a weaker tendency abroad. Tin was bought actively yesterday, following a break abroad, but prices are still on a 50c. basis. Lead is quiet but very firm. Spelter is steady. All grades of antimony have advanced sharply and are firm.

New York

Copper.—There was a good steady buying of copper in the latter part of last week which has been continued into this week, the business being almost entirely on domestic account. London quotations have declined £1 since September 27, but without effect upon the market here, which, particularly for Lake, is very strong. Lake is quoted at 17.87½c., with not a great deal to be found at that price, although some sales have been made at that figure. One producer is reported as asking 18c. In electrolytic there is some range in quotations, but it is narrow and the market appears to be contradictory as to prices, because of reports that some of the larger producers have withdrawn their price of 17.70c., cash New York, and are asking 17.75c., cash New York, which is equivalent to 17.87½c. delivered in the Naugatuck Valley, cash 30 days. Other reports are that 17.70c., cash New York, is being adhered to, while authorities say that both may be true and that it depends upon the seller. Copper was quoted in London this morning at £78 3s. 9d. for spot and £79 2s. 6d. for futures. The exports of copper in September were 25,572 tons.

Copper Averages.—The Waterbury average for the month of September was 17.87½c. The average New York price for Lake copper, based on daily quotations in *The Iron Age*, was 17.76½c. and for electrolytic, 17.65c.

Pig Tin.—Up to yesterday there was very little demand for pig tin, then there developed some active buying and undoubtedly large tonnages were absorbed as buyers bought freely. The activity appears to have been precipitated by a break in London yesterday of over £3, which was caused not so much by the statistics of October 1 as by the fact that estimates of tin shipments from the East in October would total 4,000 to 5000 tons instead of 3600 to 4000 tons as previousy estimated. Reviewing the month of September, it is seen that prices advanced rapidly, closing at the highest, approximately, 51c. The deliveries into consumption during the month amounted to 3600 tons, the total of that going into consumption for nine months showing an increase of 3300 tons as compared with the same time last year. The total visible supply September 30 was 3427 tons below that of September 30, 1911, when the total was 16,672 tons. The price of tin in London this morning was £227 15s. for spot and £226 5s. for futures. The arrivals of tin this month were 775 tons and there is afloat 2515 tons.

Tin Plates.—Little is to be said of tin plates from the viewpoint of New York except that it is reported that large orders are being placed for delivery over the first quarter of next year on the basis of $3.60, Pittsburgh, and those interested say that an advance is extremely probable because of the high price of tin and sheet bars. This year will be the banner year in the production of tin plates.

Lead.—The market in lead is dull but very firm, and there is a continuance of the bullish sentiment that has existed for some time. Prices are unchanged at 5.10c. New York, and 4.95c. St. Louis.

Spelter.—The demand continues very heavy from the galvanizers and brass mills, and producers are busy filling specifications against contracts. There is no change in prices, which are 7.65c. New York, and 7.50c. St. Louis.

Antimony.—All grades have advanced under a heavy demand, and the position of the metal is said to be the best in several years. Hallett's is quoted nominally at 9.37½c., which is the import cost, and there is none to be had from abroad earlier than January. Of course there is some stock in this country. Cookson's is quoted at 9.87½c. and Chinese and Hungarian grades at 9.25c.

Antimony, it is noted, is the last of the metals to respond to the upward movement in prices and its advances have been rapid.

Old Metals.—The demand is good, with dealers' selling prices firm as follows:

	Cents per lb.
Copper, heavy and crucible	16.50 to 16.75
Copper, heavy and wire	16.25 to 16.50
Copper, light and bottoms	14.25 to 14.50
Brass, heavy	10.25 to 10.50
Brass, light	8.25 to 8.50
Heavy machine composition	13.75 to 14.00
Clean brass turnings	9.50 to 9.75
Composition turnings	12.00 to 12.50
Lead, heavy	4.75
Lead, tea	4.50
Zinc, scrap	5.75

Chicago

OCTOBER 1.—Prices of pig tin, antimony and sheet zinc have advanced during the week. A fair buying movement is on in old metals. We quote as follows: Casting copper, 17.50c.; Lake, 17.87½c. to 18c., in carloads for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 52c.; small lots, 53c.; lead, desilverized, 5c. to 5.05c. for 50-ton lots; corroding, 5.25c. to 5.30c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 7.70c.; Cookson's antimony, 10.75c., and other grades, 9.75c. in small lots; sheet zinc is $9 f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 14.75c.; copper bottoms, 13c.; copper clips, 14c.; red brass, 12c.; yellow brass, 9.25c.; lead pipe, 4c.; zinc, 5c.; pewter, No. 1, 28.50c.; tinfoil, 33c.; block tin pipe, 40c.

St. Louis

SEPTEMBER 30.—The metal market continues to maintain strength and the demand is active. Lead is quotable at 4.95c. to 5c. and spelter at 7.40c. to 7.50c. Both are very firm. Lake copper is strong at 17.97½c. to 18.22½c. and electrolytic at 17⅞c. to 18⅛c. Cookson's antimony is 10.22½c. and firm. Tin quotations are 51.30c. to 51.45c. In the Joplin ore market the week was an active one and the prices for zinc blende were very firm. The aggregate value of the lead and zinc ore for the week was the greatest on record, standing at $472,075. The offerings of zinc blende were strong, with a range from $59 to $64 per ton for 60 per cent. with the top price for choice lots $67. Calamine was $29 to $31 for 40 per cent., with the choice lots going at $37. Lead ore was stronger than during the previous week, running to $60 for 80 per cent., while choice lots brought as high as $67, the highest in recent years. On miscellaneous scrap, which is sharply higher, we quote as follows: Light brass, 6.50c.; heavy brass and light copper, 10.50c.; heavy copper and copper wire, 13c.; pewter, 25c.; tinfoil, 32c.; zinc, 4.50c.; lead, 4c.; tea lead, 3c.

Iron and Industrial Stocks

NEW YORK, October 2, 1912.

The stock market was strong, with advancing prices until Monday of this week, when some reaction set in. Among the noteworthy advances was that of Lackawanna Steel which in five days rose from 44¼ to 55½ because of the improved condition of the steel trade and reports of much better earnings by the company. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Bald. Loco., com...	58 - 60	Railway Spring, com.	39¾ - 40¾
Bald. Loco., pref...	106¼-106½	Railway Spring, pref.	103 -103⅛
Beth. Steel, com...	45½- 50⅛	Republic, com.....	31½- 34½
Beth. Steel, pref...	78 - 79¾	Republic pref.....	91 - 92⅝
Can, com.....	43¼- 45⅝	Sloss, com.....	58½- 59¼
Can, pref.....	122¾-125	Sloss, pref.....	100
Car & Fdry., com..	61⅞- 63⅝	Pipe, com.....	20⅝- 21½
Car & Fdry., pref..	117⅜-119	Pipe, pref.....	62½- 63½
Steel Foundries.....	41 - 42½	U. S. Steel, com....	77⅛- 80¾
Colorado Fuel.....	39¾- 43¾	U. S. Steel, pref...	114⅝-117
General Electric....	182⅞-184½	Westinghouse Elec..	84⅞- 86⅛
Gr. N. Ore Cert....	48⅞- 53	Va. I. C. & Coke...	65 - 67½
Int. Harv., com....	122¾-124	Am. Ship, com.....	57 - 59½
Int. Pump, com....	28 - 29	Am. Ship, pref.....	100½
Int. Pump, pref....	81 - 81½	Chic. Pneu. Tool...	54½- 55½
Lackawanna Steel...	44¼- 55½	Cambria Steel	49¼- 51¼
Locomotive, com....	45 - 46¾	Lake Sup. Corp....	33⅞- 34¾
Locomotive, pref....	106¼-109	Pa. Steel, pref.....	99
Nat. En. & St., com.	18¼- 19⅝	Warwick	10¾
Nat. En. & St., pref.....	93	Crucible Steel, com.	15⅛- 19
Pittsburgh St., pref..	102¼-103½	Crucible Steel, pref.	95¾- 98
Pressed Steel, com..	40 - 40⅞	Harb. Wk. Ref., com.	47½- 48

Dividends Declared

The Pittsburgh Coal Company regular quarterly, 1¼ per cent. on the preferred stock, payable October 25.

The Vulcan Detinning Company, regular quarterly, 1¾ per cent. on the preferred stock, payable October 21.

The General Fire Proofing Company, regular quarterly, 1¾ per cent. on the preferred stock, payable October 1.

Personal

A. C. Dinkey, president of the Carnegie Steel Company, Pittsburgh, is taking a vacation in Montana, where he is hunting and fishing.

Irwin B. Laughlin, former treasurer of the Jones & Laughlin Steel Company, Pittsburgh, has been transferred from first secretary of the American embassy at Berlin to first secretary of the embassy at London, England.

Gust. Pers. Wern, for several years New York manager of the hoisting engine department of the Mead-Morrison Mfg. Company, has organized and is president of the Wern Machinery & Engineering Company, with offices at 30 Church street, New York. The company will engage in the manufacture and selling of hoisting, coal-handling and contractors' machinery and has the sole agency in this country of a German machine for cutting small granite blocks for paving purposes. A. E. Sylven is associated with the new company.

Henry Dreses, president Dreses Machine Tool Company, Cincinnati, Ohio, has returned from an extended business and pleasure trip to Europe.

H. W. Kreuzburg, president Champion Tool Works Company, Cincinnati, sailed for New York from Hamburg September 28. He will remain in New York until after the National Machine Tool Builders' convention.

W. O. Jacquette has been elected vice-president of the American Shop Equipment Company. His office will be at 30 Church street, New York.

Geo. Holden, superintendent of the Greenpoint Metallic Bed Company and Hospital Supply Company, Brooklyn, N. Y., has resigned his position to take up production and consulting engineering. His present address is Flushing, N. Y.

Robert Martindale, president Shirley Radiator & Foundry Company, Indianapolis, Ind., has retired from active participation in the management of the business, although retaining his interest. Fred W. Smith, manager of the company, has assumed entire charge of its interests.

Thomas C. Gilchrist has resigned as superintendent of the foundry of the United Engineering & Foundry Company at Youngstown, Ohio, with which he had been connected for 49 years. He was presented by the employees with a gold watch and charm.

W. L. Wene has resigned as purchasing agent of the Tennessee Central Railroad. The position will be abolished and the work of purchasing supplies will be taken care of by the president.

Chester R. Ross, who will act as manager of the addressing and mailing department, has been added to the staff of Walter B. Snow, publicity engineer, 170 Summer street, Boston, Mass. His experience covers three years with the Griffin Wheel Company, four years with the Boston Transcript, and a considerable period as salesman in various lines of industry.

A. O. Kuehmsted, of the Gregory Electric Company, entertained the members of the Chicago Moral Risk Club at a luncheon at the Hinsdale Country Club, Hinsdale, Ill., September 26, all who participated having a fine outing. The Chicago Moral Risk Club is composed of the credit men of the leading electrical manufacturers and jobbers.

George S. Whyte, president Macomber & Whyte Rope Company, Chicago, has moved to Kenosha, Wis., where he will have direct charge of the new wire and wire rope mill recently built by his company. The old plant at Coal City has been disposed of to Sears, Roebuck & Co., Chicago, who will occupy it after November 1. The main offices of the Macomber & Whyte Rope Company will remain at 507-509 South Clinton street, Chicago, as heretofore.

D. B. Browne, lately New York representative of the American Vanadium Company, is now metallurgical engineer of the Goldschmidt Thermit Company, 90 West street, New York City.

R. T. McCormick, formerly director and sales manager of the Petroleum Iron Works Company, Sharon, Pa.,

has been appointed sales manager of the Knox Pressed & Welded Steel Company, whose plant is at Niles, Ohio, and whose office is in the Farmers' Bank Building, Pittsburgh, Pa. Mr. McCormick will have charge of the general plate construction department.

Leighton F. Krum, who has been manager of the Treadwell plant at Myerstown, Pa., formerly operated by the Stoever Foundry & Mfg. Company, has accepted a position with the American Iron & Steel Mfg. Company, Lebanon, Pa., in its gray iron and brass foundry department.

C. S. Morse, formerly connected with the National Cable & Conduit Company, Yonkers, N. Y., has been appointed general superintendent of the new plant of the Baltimore Tube Company, Baltimore, Md.

Conrad Matschoff, of Berlin, Germany, official representative of the German Engineering Society, was the guest of St. Louis engineers several days last week. He was entertained by them at a club luncheon and escorted to various plants and technical schools during his stay. He departed for Germany via Chicago, Buffalo and Boston. Before visiting St. Louis he had visited New York, Washington, Philadelphia, Pittsburgh and Cincinnati.

H. D. Campbell, for several years vice-president and manager of the Hill Clutch Company, Cleveland, Ohio, has become associated with the Cleveland City Forge & Iron Company as general manager. R. A. Harmon, president of the latter company, has also had the title of manager, but the management has largely been intrusted to department hands. The appointment of Mr. Campbell will relieve Mr. Harmon of some of his duties and also is a step in the inauguration of a more aggressive policy on the part of this company.

J. Frank Haig has been appointed purchasing agent of the Pennsylvania Steel Company, Maryland Steel Company, Spanish-American Iron Company, Penn Mary Coal Company and Baltimore & Sparrows Point Railroad Company, vice Stedman Bent, resigned, with headquarters at the company's offices, Morris Building, Philadelphia, Pa. Mr. Haig was formerly connected with the purchasing department of the Pennsylvania Railroad at Philadelphia.

Olof Hjorth, director of the Sandviken Steel Works Company, Ltd., of Sandviken, Sweden, has been attending the International Congress of Chambers of Commerce at Boston, in his capacity as official delegate, appointed by the Swedish Government. He has also been calling on the trade in company with Sandviken's American agent, the J. Wilckes Company, 135 William street, New York. Mr. Hjorth departed for Sweden October 1.

Professors Adolf Martens and E. Heyn, of the Royal Material Testing Station, Charlottenburg, Berlin, are scheduled to return to Europe on October 3. They have taken a more extended trip, particularly as regards time, than followed by the majority of the foreign participants, among whom they were included, in the recent International Congress for Testing Materials. Besides Washington, Pittsburgh, Buffalo and Niagara Falls, they visited Montreal. They admit having learned much of interest and are to make a report to the Minister of Justice of the Prussian Government.

Obituary

GEORGE WILLIAMS, a pioneer in the iron mining industry in Dutchess and Columbia counties, New York, died in New York City September 25, aged 72 years. He at one time operated the Leedsville mine, and later took over the Morgan mine at Ancram, the Weed mine at Copake, the Reynolds mine at Halstead Station, and other properties. These mines were later consolidated in the Dutchess Mining Company, of which Mr. Williams was president.

EDWIN C. S. HUNT, of the Hoyt Metal Company's sales department at St. Louis, died September 19 after an illness of four months, aged 57 years. He was a native of Bristol, England. He leaves a widow.

WILLIAM A. MOORE, superintendent of the Commonwealth Steel Company's foundry at Granite City, Ill., was killed September 18 by being crushed between two cars. He was on his way to the plant and was crossing the tracks.

Formal Protest to Reduction in Pig Iron Freight Rates from Birmingham to Chicago

Makers of pig iron with blast furnaces located near Chicago, Milwaukee and Duluth markets have submitted an intervening petition to the Interstate Commerce Commission to have a hearing in the case involving a reduction of $1.35, or about 30 per cent., in the rate of pig iron in carloads from Birmingham to Chicago and like changes to points north and east. This case, which is No. 4800 before the commission and was instituted by the Sloss-Sheffield Steel & Iron Company et al. against the Louisville & Nashville Railroad Company et al., is to be heard October 28. The intervening petition is made in behalf of the Iroquois Iron Company, Chicago; the Federal Furnace Company, Chicago; the Northwestern Iron Company, Milwaukee, Wis.; the Thomas Furnace Company, Milwaukee, and the Zenith Furnace Company, Duluth, Minn.

The petition mentions that the combined investment in the several furnaces represents an outlay of substantially $10,000,000 and there is manufactured annually approximately 1,000,000 tons of pig iron. It is explained that the furnaces were located to supply the local demand, but in addition they supply to a limited extent foundries in Minnesota, Wisconsin, Iowa, Illinois and Indiana. The petition goes on to outline at length how the raw materials are drawn from distant sources, while the raw materials entering into the manufacture of pig iron in the Birmingham district are drawn from sources of supply in close proximity to the furnaces. It is urged that the establishment of the furnaces of the petitioners was with the knowledge of the existing relation of rates to and from furnaces in the South and in the North, and it is felt that any radical change in this relation would seriously affect the interests of the petitioners. They ask for the opportunity to file briefs, to examine witnesses and be heard in oral argument.

A Prize of $100 for a Name

Harold P. Gould, advertising manager of Joseph T. Ryerson & Son, steel jobbers, Chicago, announces that a prize of $100 will be given for a name which is to be applied to a book in which their stock is systematically listed for a steel buyer's desk. Their stock includes everything needed in any kind of steel construction, from rivets and boilers and high speed tool steel to the entire steel material for bridges and skyscrapers; also many steel specialties for various purposes. The book referred to is a leather bound, loose leaf catalogue of handy size for the desk and with convenient thumb indexes. The contest closes October 15, 1912. Mr. Gould has issued a circular giving full particulars for those who desire to participate in this contest.

The results of the guessing contest held by Rogers, Brown & Co., in connection with their exhibit at the foundry machinery exhibition in Buffalo last week have been announced. A feature of the Rogers-Brown exhibit was a bed of Susquehanna pig iron kept intact and set up to form a fence. It was 20 ft. long and carried 29 pigs. Some 2200 guesses were registered. The prize, a large box of cigars, was won by H. W. Gilbert, superintendent of foundry, Delaware & Hudson Company, Watervliet, N. Y. The weight of the gigantic comb was 4220 lb. and the winning guess was 4218 lb. Allen P. Ford, Crane Valve Company, Bridgeport, Conn., guessed 4225 lb.; B. Webster, Jr., Buffalo, N. Y., guessed 4228 lb. and E. A. Morrison, Canada Foundry Company, Toronto, figured the sow and its pigs to weigh 4212 lb.

The Jones & Laughlin Steel Company has started the erection of 240 rectangular coke ovens at Aliquippa, Pa., which will be ready for operation about the first of the year. Blast furnace No. 4 of the company's plant at Aliquippa was put in blast on Wednesday, October 2.

In the Government suit for the dissolution of the United States Steel Corporation, the taking of testimony at Pittsburgh began on Tuesday of this week. Several witnesses, tinplate makers, were examined on that day.

The Twelve-Hour Shift in the Steel Foundry*

Results of Its Abandonment in the Commonwealth Steel Company's Open-Hearth Department and the Substitution of an Eight-Hour Shift

BY R. A. BULL†

It will doubtless be granted that, on account of recent agitation concerning the long hours of employment almost universally obtaining in certain departments of steel works and blast furnaces in the United States, a frank discussion of this question in the sessions of this association, whose membership includes many steel founders who employ the 12-hour shift on their furnace platforms, is in order at this particular time. You are aware of the public attention now being given to this question, partly through articles which have appeared in the popular magazines, and more especially because of Congressional inquiry. Certain leaders in the world of iron and steel have lately testified before the Senate committee concerning the necessities for continuous operation of steel and blast furnaces, requiring attention of attendants for every hour of the day for every day of the week, and have endeavored to describe the nature of the duties devolving upon these men. I am frank to say that the testimony given upon the latter point by some captains of industry has amused me, as it doubtless has many others, by its mis-statement of facts, possibly due to incorrect knowledge of working conditions.

As employers of labor, we must look this question squarely in the face, realizing, if we do not understand as well as a layman may, the nature of work we require of men for 12 hours per day for seven days of the week, it is high time that we fully inform ourselves, and further, that having ascertained those facts, we will by no means benefit ourselves by attempting to disguise conditions.

Trying Conditions of Steel Furnace Work

The question of the long shift, so far as the American Foundrymen's Association is concerned, crystallizes into a consideration of the melter and his furnace helpers, and has to do with the steel foundry. I assume it to be unnecessary to set forth in any sort of detail the nature of the steel-maker's occupation, to those members of this association who are engaged in the manufacture of steel castings. Briefly, however, for the benefit of all others who may be interested in the subject, the work is distinctly arduous, physically and mentally, carries a responsibility which puts a man's nervous system in frequent high tension, and is especially trying on the physical system during the summer months. It can, however, be truthfully stated that the difficulties of the work are not constant but periodic, also that the Sunday shift in the steel foundry (not necessarily in the steel mill) is a very easy one. A furnaceman may have a considerable interval of comparative relaxation, when his furnace and heat respond nicely to his manipulation, and weather conditions prevail which do not make the working temperature a hardship. And again he may, in spite of all the experience and skill at his command, have about as trying and exhaustive a day's work, without intermission and for several days in succession, as one can readily imagine. This latter fact being admitted, one can understand why our legislators are putting the furnaceman's occupation under scrutiny, in the interest of humanity. It may be claimed, and with some degree of truth in certain instances, possibly, that all of this interest has not been stimulated by humane motives, but for political reasons. But disregarding the ulterior motives of the ever-present demagogue, and analyzing this question conservatively, it must be apparent to us that a few more years may see legislation honestly conceived that will put an end to the 12-hour shift for the steel-maker.

Injustice of the Long Turn on the Furnace Platform

This paper does not purport to deal with the humanitarian side of the issue. But without stating in brief my own convictions it might be claimed that I evade that phase of the question. Not wishing to invite such a criticism, at the risk of being superficially regarded as voicing an opinion, which, if maintained by those of greater influence than myself, should be cried down as inimical to large and important iron and steel interests, I do not hesitate to state my belief in the absolute injustice, humanely speaking, of the 12-hour shift on the furnace platform. I trust that I shall not be classified as a Socialist for having such a conviction. The question must be decided neither from the viewpoint of the plutocrat nor that of the walking delegate, and I claim to have formed my conclusions after consideration of the question from a conservative standpoint, and after many years of personal observation of working conditions surrounding the furnaceman's work. Furthermore, to offset any suggestion of bias, let me say that I do not now hold, and never have held, a union card, active or honorary, issued by any labor organization.

Hourly Wage Rate Higher for Eight-Hour Shifts

The company with which I am associated some time ago inaugurated three eight-hour shifts as applying to the furnace and boiler crews, both of which had previously worked 12-hour turns. It had been my opinion and that of my immediate superior that such a revision of our working schedules in these departments would be accompanied with so much more efficient handling of the furnaces that if the rates per hour were reasonably increased to remove the natural disinclination of the men to receiving only two-thirds of their former monthly income, the final result would show economy. This was the purely business side of the question, whose humanitarian aspects received our first consideration. A careful adjustment of wages was planned which yielded an increase per hour of 22 per cent. to the first helpers, 18 per cent. to the second helpers and 16 per cent. to the third helpers. Even the door boy was included in the scheme, and was to receive an advance of 19 per cent. per hour. The boiler firemen were to be increased 19 per cent. per hour and the coal-passers 14 per cent. It should be borne in mind that none of the men affected had asked for a change in the shift hours, or an increase of wages, nor had any plant in our vicinity any such change in contemplation.

Permission of our principal executive officers was obtained to inaugurate the new plan, and when it was put into effect it came as a glad surprise to the various crews. No inducements were offered them to render more efficient service, nor was any suggestion made that we proposed to keep comparative data. But it was an easy matter to make comparisons because we had a meter registering within ½ of 1 per cent. of accuracy by careful test, on each open-hearth furnace line to record the fuel oil consumption, a magnetic recorder to indicate the frequency with which the furnace burners were reversed, a system by means of which all extra pig iron used in each heat was weighed and recorded, a recording pressure gauge to show the steam pressure maintained in the boiler room, and finally the chemical analyses and physical tests customarily made for every heat to determine the relative qualities of the product.

Conditions of the Comparison Made

Before studying the comparative record, permit me to state for your more intelligent consideration of the various showings, a few important facts. The first four weeks prior to the change and the first four weeks following were taken as those best for comparison, because working conditions for these two periods were as nearly identical as could readily be found in our plant. The melting stock, the fuel oil and the boiler coal were of uniform quality throughout, so far as the same grades or brands of these materials may possibly be. The demand made upon each

*Presented at the Buffalo Convention of the American Foundrymen's Association, September, 1912.

†Commonwealth Steel Company, Granite City, Ill.

250-hp. boiler under fire was practically the same in each case, the air load being steady, but the electrical load extremely intermittent for the entire eight weeks, a chronic condition which in our case militates greatly against a desired uniformity of 125 lb. of steam pressure. The practice on the open-hearth platform had obtained for years of reversing the burners every 20 minutes when a furnace was charged and every 30 minutes when empty. It was, of course, the object to make the least possible additions to the percentage of pig iron charged, and the furnacemen were required to exercise such judgment in this respect as would keep the amount of extra pig within reasonable bounds and as low as possible. Naturally they were also expected to keep the burners nicely adjusted and to maintain the proper temperature of the bath at the lowest possible oil consumption. The furnaces were basic and 47,000 lb. of metal was charged per heat. The shift hours under the old plan had been from 6 to 6; under the new arrangement they are from 7 a. m. to 3 p. m., 3 p. m. to 11 p. m., and 11 p. m. to 7 a. m., these being the most convenient because of local conditions The crews change their shifts the first day of each week, thus giving every three weeks the full daylight turn to each crew. Having made the above points clear, I refer you to the comparative record.

Improvement Under the Short Shift

It will be readily understood that we were greatly gratified at the comparison, which indicates fully a more economical and efficient manipulation of both open-hearth and boiler furnaces. It will be observed that the differences in most cases are slight, but the pleasing and important feature is that the essential ones are in favor of the short shift.

COMPARISON OF RESULTS IN OPEN HEARTH DEPARTMENT AND BOILER ROOM WITH 12-HOUR AND 8-HOUR SHIFTS.

Open-Hearth Furnaces.

		12-Hour Shift.	8-Hour Shift.
Average amount of extra pig iron charged per heat		556 lb.	424 lb.
Average amount of fuel oil consumed per heat		1,275 gal.	1,138 gal.
Average amount of fuel oil consumed per ton of metal charged		55 gal.	49 gal.
Average number of cracked castings per heat		0.49	0.37
Average of longest intervals between reversals of burners during 12-hour periods		28 min.	26.7 min.
Average of chemical analyses of all heats	Carbon	Correct percentage	Correct percentage
	Phosphorus	0.011%	0.011%
	Sulphur	0.022%	0.022%
	Manganese	2 points under	Correct percentage
	Silicon	1 point over	Correct percentage
Maximum phosphorus in any heat		0.022%	0.018%
Maximum sulphur in any heat		0.025%	0.025%
Average physical tests of all heats	Yield point per sq. in	13.0% over	15.5% over
	Tensile strength per sq. in	5.9% over	5.8% over
	Elongation in 2 in	4.6 points over	4.1 points over
	Reduction of area	7.9 points over	7.2 points over
Minimum physical tests of any heat. (Not combined results of one bar, but individual minimums of results covering all bars.)	Yield point per sq. in	2.5% under	7.7% over
	Tensile strength per sq. in	4.7% under	1.4% under
	Elongation in 2 in	5 points under	3 points under
	Reduction of area	8.3 points under	7.6 points under

The term "point" means 1-100 of 1 per cent., where analyses are referred to, and elsewhere 1 per cent., but in all cases it refers to differences from works standard, being found by simple subtraction. In no case does it indicate relative or proportionate results. Where such are shown they are indicated by "per cent" followed by "over" or "under." "Over" and "under" mean respectively results more or less than those desired by plant requirements, and we have no reference to A.S.T.M. standard specifications, the requirements of which are fully met in all the minimum results obtained under the eight-hour shift. "Correct percentage" means exactly the composition desired. Lowest possible content of phosphorus and sulphur are demanded by plant requirements.

Boiler Room.

	12-Hour Shift.	8-Hour Shift.
Number of times when steam pressure fell below 110 lb	77	42
Number of times when steam pressure fell below 105 lb	9	3
Number of times when steam pressure fell below 100 lb	1	0
Operating expense for Boiler Room Labor.	On 12-hour shifts, from 6 A. M. to 6 P. M., one head fireman, two second firemen and two coal passers were employed; and from 6 P. M. to 6 A. M. one head fireman, one second fireman and one coal passer, at total expense per day of 24 hours of $19.50. On 8-hour shifts, from 7 A. M. to 3 P. M., one head fireman, one second fireman and two coal passers were employed; and on each of the other two shifts one head fireman, one second fireman and one coal passer were employed, at a total expense per day of 24 hours of $19.12, or 38 cents less per day of 24 hours divided into three 8-hour shifts, despite the increased wages per hour.	

It was not to be expected that the greatest improvement would take place immediately after the change, and had all working conditions been some months afterwards practically the same as they were previous to the adoption of the eight-hour shift, there could have been made a fairer comparison. Certain important working conditions having changed, it was advisable to compare periods as indicated. But it is interesting to know that in those instances where conditions remained constant there was a noticeable improvement the second month as compared with the first month after the new schedule was in force, as, for example, the reduction in the average amount of extra pig iron charged per heat, from 424 lb. to 137 lb.

Eight-Hour Turn More Economical

I do not know if any such comparisons as those made the basis of this paper have heretofore been made in a similar fashion. It is quite possible that the idea has some degree of novelty in certain of its details, for, notwithstanding the criticisms recently directed against the 12-hour shift, its prevalence is still almost universal in furnace operation in this country. And I feel satisfied that any careful comparison along the lines indicated by the record herein shown would convince any steel manufacturer of the wisdom of operating with three eight-hour shifts, purely from an economic standpoint. Speaking for the people with whom I am associated, we are greatly pleased over the change. And I can speak for the men in the same terms, for our furnacemen are enthusiastic in their praise concerning the new plan. And there is no small amount of inward satisfaction in the knowledge that we have done a humane thing. It may be argued that, while the demands of humanity and economy are admittedly strong on the furnace platform in favor of the eight-hour shift, its adoption is unwise there because of the effect it might have upon workmen in other departments, where the nine- or ten-hour day is at present prevailing, and where conditions would not commercially permit the universal eight-hour day. But conditions in a steel foundry cannot be found in any other department that are at all similar to those found around the furnaces, and that fact is apparent to molder, pattern-maker, core-maker, machinist, electrician or any other mechanic. Any argument which can be so readily met must fall and its best answer is found in the fact that its adoption in the plant whose experiences have in a way been here described has resulted in no tendency toward the demand for an eight-hour day among any of the skilled trades represented in our organization.

Therefore, viewed from any conceivable angle, I claim the change is justifiable and you will do well to make it so far as your open-hearth furnaces are concerned. As to your boiler firemen, each operating head must decide for himself. In our particular case it appeared to be, and finally proved to be, advisable from every standpoint. Conditions in certain other boiler rooms are very different from ours, practically the entire evaporation taking place during the daylight hours in many of them. Since the results are of some interest, however, I have included the comparisons made in our power plant. Reverting finally to consideration of the steel-maker, whose performance under both schedules is made the burden of this argument, the basic principle is absolutely sound and rests on the incontrovertible fact that you cannot expect any man to give you the best that is in him when you keep him employed without intermission for 12 hours per day, seven days per week, at work making a heavy demand upon his mental and physical powers, under conditions of high temperature such as obtain on a furnace floor. To expect the best results under such circumstances is folly and to continue operating under them spells, not the title of this paper, but the *costly* side of the 12-hour shift.

Premium System in Foundry Cleaning Room*

Increased Output in the Finishing Department of a Steel Foundry by Basing Wage Payments on the Weights of Castings

BY A. W. GREGG, SOUTH MILWAUKEE, WIS.

The steel foundry referred to in the following is connected with a manufacturing establishment which builds steam and electric shovels, several types of large dredges, pile-drivers, dragline excavators and other heavy machinery. The castings made vary from a few pounds to 10 and 11 tons each. Only a little over one-third of the work is standard, and even the so-called standard work is subject to frequent change in the course of improvement in design. In other words, the work is practically job-work.

The premium system of payment was introduced for molding several years previous to the proposal to use it in the cleaning room. Molding rates are set on individual jobs on the basis of a time study. The rate is obtained by adding 60 per cent. to the proper time to do the job and the bonus to the molder is one-half the time saved. The proper time is considered to be the time in which the average good man, working under average good conditions, can do the job, no account being taken of unfortunate circumstances, such as breaking a core, a delay for the crane, etc.

The labor employed in the foundry cleaning room is nearly all foreign born, composed of Polish, Greek, Hungarian, Slavish and Armenian laborers. About one in twenty speaks English, and grave doubt was entertained as to the possibility of making this class of labor comprehend the idea of a premium rate. If this fear had been well founded, no results could have been accomplished because the object of setting rates is to increase production and this object is defeated unless the men strive to earn a premium. Also any premium paid to a man who is not striving to earn it is a gift, pure and simple. Experience quickly proved that these men could grasp the idea of increased pay for increased output and that they were more than anxious to earn the extra money.

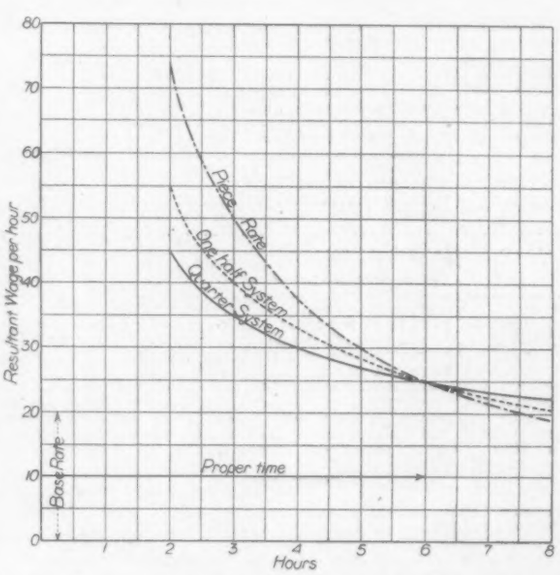

Chart Comparing Different Wage Payment Systems

Undoubtedly the fact that the molding was rated made it far easier to secure the co-operation of the men when rates were set in the cleaning room, for it was generally known among the chippers that the molders earned good wages through the premium system.

Basis of the Cleaning Room Premium Rates

The work of cleaning castings is divided into five natural classes: sand-blasting, saw-work, sledge and cold-cut, grinding and air-hammer work. The basis selected for setting rates was weight, and curves have been developed expressing the rate plotted against the weight of the casting for the air-hammer, grinding and sledge work. The rate is the proper time to do the job plus 100 per cent. The bonus to the man is one-quarter of the time saved, thus permitting a man who does the work in the proper time to earn an increase of 25 per cent. in wages. The selection of 25 per cent. as the premium factor, which has proved to be ample, was caused by a desire to play safe, for the nature of the work makes it very difficult to determine what is the proper time. The method of rating sand-blasting and sawing is handled in a different manner.

A timekeeper keeps a record for each man of the time in which each job is done. The time card has a space after the pattern mark for the weight of the casting, and this is filled in by the time checker, who then gets the rate from the proper curve and marks it on the card. The time put in by each man each day is substracted from the sum of the time limits for the work completed on that day and one-quarter of the difference is awarded to the man as a bonus.

The premium system of payment added two men to the clerical force, as indicated above; a time-keeper and a time-checker. If the rates were set for each pattern mark, a third man would be necessary to make time studies and set rates. The selection of weight as the basis and the use of curves obviates the necessity of a rate setter.

The First Experiment at Rate Setting

The points of interest are the quarter system of premium payment and the method by which the curves were developed. The first experiments in setting rates on cleaning-room work were made on the air-hammer work. The time to clean what may be regarded as a standard casting was carefully studied by the foreman with two of the best and most intelligent workmen doing this work. After deciding on the proper time, 50 per cent. was added, and this rate was given to the man with a careful explanation that half of the time saved would be awarded as a bonus. The output of these two men increased in such a gratifying manner that a dozen or more additional rates were set.

After the first payday all the men began to ask for premium work. The curious discovery was made that it was not necessary to tell the men what rate had been set on the job. They were satisfied to know that a rate had been set, and to urge a man to his best efforts it was only necessary for the foreman to pull out his watch, point to a job and utter the magic word "premium." The men from the start seemed to assume that the rates set would be fair and that hard work would be rewarded by increased pay.

The result of setting rates was so uniformly encouraging that more and more were set. For the first four months the foreman set all the rates and he and his assistant kept time on the work. By the end of this time 75 per cent. of the work going through was kept constantly rated and it was found necessary to employ a time-keeper. Also the task of setting so many rates was taking such a large share of the foreman's time that it was necessary to devise some wholesome method of rating or secure a man to set rates.

The Equity of Rating on Weight of Casting

The happy idea of putting the rating on a weight basis was suggested. During the first four months upward of 2000 rates had been set, and the first step was to go over these rates to see if there was any definite relation be-

*Paper, substantially in full, read before the American Foundrymen's Association, Buffalo, N. Y., September 24, 25 and 26.

tween weight and rate. To do this, the output per rate was calculated for each of the rates which had been set by time study. The rates plotted against the weight of castings gave a surprisingly smooth curve. Naturally, the output per hour in pounds increases very rapidly as the weight of the casting increases.

The curves were checked against the old time-cards for several weeks back and it was found that the premium earned by the gang as a whole averaged about the same with the rates set from the curves as under the individual rates. However, it was also found that the earnings of some men ran much higher and others much lower than under the old rates and that this variation did not altogether represent a variation in the ability of the men. The curves, it seemed, would give the total premium earnings for the gang correctly, but the distribution to the individual laborer was not altogether equitable.

Several methods were considered to overcome this difficulty, but the one finally adopted was the quarter system. Previous to this time the curves had been based, as the individual rates were, on an addition of 50 per cent. to the proper time and one-half of the time saved was allowed as a bonus. With the quarter system, as before stated, 100 per cent. is added to the proper time and one-quarter of the time saved is paid as a bonus.

Why the Quarter System Was Adopted

The quarter system will tend to neutralize the effect of a man getting a lot of jobs which require either more or less than the average amount of work. Under the quarter system a fortunate run of work will not so materially increase a man's earnings, nor will an exceptionally unfortunate run of work so materially decrease them.

To illustrate the point the accompanying curves have been drawn to show the variation in wages under piece work, one-half premium system and one-quarter premium systems resulting from doing a job in different lengths of time. The same conditions are used in each of the three cases: namely, a base rate of 20 cents and a bonus of 25 per cent. if the work is done in the proper time. Where the proper time to do a given job can be determined with great accuracy, piece work or the one-half premium system will give the best results, because the reward for increased output and the penalty for decreased output are both greater. But where, as in the case of cleaning castings, the nature of the work makes it impossible to determine the proper time with certainty, the quarter system will give the most satisfactory results because forunate jobs will not increase the bonus earned so rapidly, and neither will unfortunate ones cut off entirely the chance to earn premium. It will be noted also that the curves show that the disciplinary effect of the quarter system very nearly approximates that of the one-half system.

Premium Basis for Saw Work in Cleaning Room

Air-hammer work, sledge work and grinding are all rated by the above described method of curves and quarter system, the rates being based on the output per hour in pounds. Sand-blasting and saw-work are rated in a different way. The sand-blast work had been rated at a definite price in cents per ton for several years previous to the rating of chipping and grinding, and as this was considered satisfactory it was not changed. Rating the saw-work was a comparatively easy problem, the rate being based on the linear inches cut per hour and the one-half premium system being used.

Reduced cost and increased output are the principal benefits obtained by the premium system of payment. The output per man in the case under discussion has increased about 60 per cent. since the men have had an incentive to exert their best efforts. The increase in the average wage has amounted to about 20 per cent. The change in the attitude of the men toward their work is well illustrated by the fact that they are now using at their own request sledges which are 3 lb. heavier than they had been using before. When working under the old system the foreman was very often compelled to discharge men for grinding sledges on an emery wheel to make them lighter. Such a change of attitude on the part of the men, of course, makes the work of supervision a far less exacting task, and the increased earnings have resulted in a more contented and more efficient lot of workmen.

July Iron and Steel Exports and Imports

Both exports and imports of iron and steel showed a slight increase in July as compared with June, according to the report of the Bureau of Foreign and Domestic Commerce. The total value of the exports of iron and steel and manufactures thereof, not including iron ore, was $24,913,052 in July, against $24,705,802 in June, while the value of similar imports in July was $2,476,741 against $2,454,694 in June.

The exports of commodities for which quantities are given totaled 272,898 gross tons in July, against 273,138 tons in June and 162,851 tons in July, 1911. The details of the exports of such commodities for July and for seven months ended with July, compared with the corresponding period of the previous year, are as follows:

Exports of Iron and Steel.

Commodities.	July 1912. Gross Tons.	July 1911. Gross Tons.	Seven Months 1912. Gross Tons.	Seven Months 1911. Gross Tons.
Pig iron	16,386	9,446	148,703	76,577
Scrap	6,429	5,919	62,191	51,438
Bar iron	3,513	1,479	11,003	11,007
Wire rods	3,444	1,074	37,219	9,555
Steel bars	19,903	7,960	105,815	71,168
Billets, ingots and blooms, n.e.s.	29,293	13,578	165,248	149,419
*Bolts and nuts	1,549	.....	1,549	.....
†Hoops and bands	1,143	315	5,650	††315
*Horse shoes	122	.....	††122	.....
Cut nails	529	560	6,777	5,877
†Railroad spikes	580	.....	††580	.....
Wire nails	6,950	1,816	44,268	29,833
All other nails, including tacks	441	905	6,611	7,348
Pipe and fittings	20,768	12,780	153,936	111,784
Radiators and cast-iron house heating boilers	533	290	2,263	1,870
Steel rails	46,194	40,973	271,747	269,853
‡Galvanized iron sheets and plates	14,264	8,862	14,264	64,414
All other iron sheets and plates	5,399		112,399	
‡Steel plates	25,276	17,154	§150,721 ††25,276	126,374
‡Steel sheets	6,840		††6,840	
Structural iron and steel	32,265	21,287	164,685	125,665
Tin and terne plates	8,763	4,713	54,164	30,291
Barb wire	7,693	6,424	54,320	46,705
All other wire	14,621	7,316	89,613	74,294
Totals	272,898	162,851	1,695,964	1,263,787

*Included in "all other manufactures of iron and steel" prior to July 1, 1912.
†Included in "all other manufactures of iron and steel" from July 1, 1910, to June 30, 1911.
‡Not separately stated prior to July 1, 1912.
††Figures cover period since July 1.
§Figures are for six months, January to June, inclusive.

The imports of commodities for which quantities are given total 17,902 gross tons in July as compared with 21,407 tons in June and 15,780 tons in July, 1911. Details of such imports for July and for seven months ended with July, compared with the corresponding periods of the previous year, are as follows:

Imports of Iron and Steel.

Commodities.	July 1912. Gross Tons.	July 1911. Gross Tons.	Seven Months 1912. Gross Tons.	Seven Months 1911. Gross Tons.
Pig iron	8,728	8,538	64,604	97,552
Scrap	1,476	1,419	9,595	12,572
Bar iron	4,238	2,300	15,333	16,496
Billets, bars and steel plates, n.e.s.	1,503	1,394	10,788	17,439
*Structural iron and steel	150	216	1,430	†216
Sheets and plates	536	168	1,846	1,410
Tin and terne plates	64	235	1,052	12,368
*Steel rails	88	326	1,779	†326
Wire rods	1,119	1,184	8,380	10,001
Totals	17,902	15,780	114,807	168,380

*Included in "all other manufactures of" prior to July 1, 1911.
†Figures cover period since July 1.

The imports of iron ore in July were 185,677 gross tons against 180,122 tons in June and 200,845 tons in the month of July, 1911. The total importations of iron ore for seven months ended with July were 1,180,053 tons against 1,002,713 tons in the coresponding period of 1911. The total value of the exports of iron and steel and manufactures thereof, not including iron ore, for seven months ended with July, was $164,958,525 against $139,099,733 in the corresponding period of 1911. The total value of the imports of iron and steel and manufactures thereof, not including iron ore, for seven months ended with July, was $15,060,533 against $17,242,937 in the corresponding period of 1911.

Allied Foundrymen's Meetings in Buffalo

(*Continued from page 789.*)

The Premium System in the Steel Foundry

A paper entitled "The Premium System as Applied to the Finishing Department of a Steel Foundry" was read by A. W. Gregg, South Milwaukee, Wis. It is reprinted elsewhere in this issue.

A paper by W. M. Carr, Wheeling, W. Va., on the detachable open-hearth furnace had been scheduled but Mr. Carr wrote that he would be unable to be present.

A pleasing incident here occurred with the arrival in the meeting room of Prof. E. Heyn, sub-director Royal Material Testing Station, Charlottenburg, Berlin, who came to this country to attend the International Congress for Testing Materials in New York a few weeks ago. In a happy little speech in remarkably good English he congratulated the association on its noteworthy achievements and expressed pleasure in having the opportunity of participating in a meeting of the association.

Cupola Tests

A paper by P. Munnoch, American Brake Shoe & Foundry Company, Mahwah, N. J., was presented on the amount of air required for combustion in the cupola and describing a blast velocity gauge. This was followed by a paper entitled "Rational Cupola Melting," by the secretary, Dr. Richard Moldenke, who is to discuss the subject along substantially the same lines before the meeting in the latter part of this month in Cleveland of the American Institute of Mining Engineers.

The Government work in cupola melting tests was also reported. This contribution to the meeting, taking the form of a paper submitted by A. W. Belden, of the Bureau of Mines, Pittsburgh, was particularly well received and aroused an active discussion, but as the Government is to issue an extended review of the tests, the details are not forthcoming at this time. In fact, it was by special arrangement with the director of the bureau, Dr. Joseph A. Holmes, that the American Foundrymen's Association was given the opportunity first to learn at some length what the tests showed.

The tests were made on a 36-in. Whiting cupola of usual proportions and samples of the gases during their travel from the tuyeres upwards were taken and analyzed and the temperatures of the fuel bed measured. Upper and lower tuyeres are provided, but the upper ones were not used in any of the tests. The tuyere area was 96 sq. in. and the area of the cupola, lined to 27 in., was 573 sq. in., a ratio of 1 to 5.96. The cupola was connected by a 10-in. pipe, 15 ft. long, with a No. 2 10 x 35-in. horizontal Roots blower belt driven by a 10-h.p. motor. The blower was calibrated and knowing the amount of air delivered per revolution in these tests, 4.8 cu. ft., the number of revolutions, the average pressure and the slippage at this pressure, the total amount of air delivered was calculated. Preliminary tests suggested the use of 1000 cu. ft. per minute as a normal condition.

The cupola was divided into sections, and 2-in. holes were cut through the wind box and inner shell. Through each of these a 1½-in. pipe 10 in. long is passed, the inner end extending 1 in. past the inner shell and into the brick lining, the outer end extending 1 in. outside the wind box and threaded to take a cap adapted to fit tightly the gas sample tubes when inserted. On the opposite side of the cupola holes were cut at corresponding levels and fitted with 3-in. pipe in similar manner. Through these the temperature measurements were taken.

COKE ALONE USED WITHOUT IRON OR FLUX

About 24 in. of coke was placed upon sufficient wood to insure proper kindling. The coke was allowed to ignite and burn until the top showed bright. Coke in small amounts was added from time to time, each succeeding charge being held until the preceding charge burned through. After the last small charge was added sufficient time was given to insure its burning evenly over the whole surface. This was an indication that the burning was over and through the whole bed of coke and not localized as sometimes happens when proper precautions are not taken. The last amount of coke brought the total charge up to within 6 in. of the charging door. The total charge was approximately 750 lb. for each test. Ten minutes after the total charge was added the blast was turned on and continued for 15 min. before the test began. The reason for allowing this length of time was to insure uniform conditions over the whole fuel bed and it was decided upon as being more than necessary under regular commercial practice for the appearance of iron at the cupola spout, an indication that melting has begun.

POSITION OF THE MELTING ZONE

From the samples of gases taken by means of the gas collecting tubes it was possible to locate the limit of the oxygen content of the gases. This showed that actual combustion of the fuel takes place around an inverted cone of the fuel bed, the apex of this cone being at the center of the cupola in line with the bottom of the tuyeres and flaring out to the lining at a point 20 in. above the tuyeres. The hight of the melting zone is determined by the physical condition of the coke and the rate of heat absorption of the iron. If the coke is porous the charges of iron, Mr. Belden said, should be small to prevent the coke burning out and letting the iron down into the oxidizing zone before melting is accomplished. If the coke is heavy and dense, or if anthracite coal is used, the charges may be made large, as the fuel burns more slowly and gives time for increased melting. At some points above this zone the temperature, while still high enough to melt iron, is not high enough, he added, to impart its heat quickly and give hot iron. The passage of this melted iron through the lower zones, although the temperature in these zones be exceedingly high, is too rapid for the absorption of enough heat to materially raise its temperature and cold iron is the result. These experiments confirm the general opinion that the hottest part of the cupola is where the lining is most burned out.

THE CONCLUSIONS BASED ON THE CUPOLA TESTS

Mr. Belden gave the conclusions based on the tests substantially as follows: The bellying out of the lining of the cupola is a perfect index of the practical melting zone and is at the point of highest temperature and absence of oxygen. Care must be taken not to melt below this zone, as the oxygen of the blast is not entirely removed and the iron will be oxidized or burned.

The whole problem of hot iron free from effects due to oxygen is solved by using small charges evenly distributed on the fuel bed, and confining the melting to a few inches above the point shown by the burning out of the lining to be the hottest cross section of the fuel bed. If the first charge of iron is so placed that melting begins, say 6 or 8 in. above this cross section and is completed before any of the iron gets below this point, and the following coke and iron charges are so regulated as to maintain this melting zone, the best possible results will be obtained.

It is further pointed out that the use of upper tuyeres is not necessary but a positive detriment to the production of the best iron. The introduction of air into the fuel bed above the tuyeres, even though in small amount, increases the liability of injurious effect from oxygen and serves no useful purpose. The increased tonnage supposed to be due to the use of upper tuyeres can be just as easily accomplished by blowing in through the bottom tuyeres the proper volume of air.

In response to suggestions made in the discussion, Mr. Belden expressed himself as believing that a cupola of different size would not have given different results. He was inclined to regard the so-called penetration of the blast as unnecessary, that what is desired is the requisite amount or volume of blast. He admitted that the greater the penetration the less the hight of the cone of high temperature and no free oxygen. Mr. West wished it might be possible to investigate a center blast cupola, a type of construction which Dr. Moldenke felt was likely to be advantageous in wiping out of existence the inverted cone, which of course was a result of the position of the air blasts. Quite a little of the discussion had to do with the value of an upper row of tuyeres. Some of the views were that they provided the cupola with means for adjusting the air conditions to widely varying demands, in one case flexibility as to tuyere area to the extent of 60 per cent. increase being held as fortunate, but Mr. Belden was firm in his conviction already stated in this regard. The paper was commended especially as giving a scientific basis for common sense practice.

Papers Which Could Not Be Discussed

The Thursday afternoon and last session of the American Foundrymen's Association meeting was opened with the reading of a number of papers by title, owing to the numerous business matters needing consideration. One of these papers was "On Pattern-Making," by James Glass, Pittsfield, Mass., who gave a number of illustrations showing how patterns may often be built up of relatively simple parts all susceptible to being wrought out on the machine and thereby minimizing hand labor. Another paper was presented by S. A. Capron, H. B. Smith Company, Westfield, Mass., entitled "Recovery of Shot in Small Foundries." It described a shop arrangement for separating by magnetic means from sand and stones the shot and fines lost in the foundry sand. Another of the papers was "About Sherardizing," by Thomas Liggett, Jr., New Castle, Pa.; another was on "The Importance of Dispatching in the Foundry," by C. E. Knoeppel, New York City, and another was entitled "Some Short Cuts in the Foundry Laboratory," by P. A. Boeck, Worcester, Mass.

Molding Sand Tests

Brief mention only could be made of the molding sand tests of the association. The results, however, are available in an imposing pamphlet of 108 pages which covers the following divisions of the subject: Mineral characteristics of molding sands; the mineral constituents of the 80 natural and the 12 artificial molding sands tested; 168 photomicrographs of the different sands accompanied by a monograph on the subject by H. C. Loudenbeck, Wilmerding, Pa.; the so-called rational analyses of the molding sands tested, these being made under the direction of H. E. Field in the laboratory of Mackintosh, Hemphill & Co., Pittsburgh; and the tests themselves made by Dr. Moldenke and reported at length in terms of fineness, transverse strength of the sands tempered, crushing strength, permeability to air and clay bond.

Officers for 1912-1913

The nominating committee, which consists of past presidents, presented through J. S. Seaman, Seaman-Sleeth Company, Pittsburgh, the father of the association, a ticket for officers for the next year, which ticket was unanimously accepted. The following officers for 1912-1913 were forthwith elected:

President, H. D. Miles, Buffalo Foundry & Machine Company, Buffalo, N. Y.

Vice-presidents, F. B. Farnsworth, New Haven; T. L. Richmond, Buffalo Scale Company, Buffalo, N. Y.; Walter Wood, R. D. Wood & Co., Philadelphia; Alfred E. Howell, Phillips & Buttorff Mfg. Company, Nashville, Tenn.; R. A. Bull, Commonwealth Steel Company, Granite City, Ill.; T. W. Sheriff, Sheriff's Mfg. Company, Milwaukee, Wis.; D. R. Lombard, Lombard Iron Works & Supply Company, Augusta, Ga.; S. B. Chadsey, Massey-Harris Company, Toronto, Ont.

Secretary-Treasurer, Dr. Richard Moldenke, Watchung, N. J.

Major Speer Elected to Honorary Membership

Formal resolutions were passed acknowledging that Maj. Joseph T. Speer, who completed at the meeting his second term as president, "has devoted unsparingly his time and attention to the upbuilding of the association and diplomatically conducted its business, strengthened its position, outlined its policies and established it on the basis of friendly relations with all affiliated bodies." He was by the same resolutions elected an honorary member of the association.

A vote of appreciation of the work of the secretary, Dr. Moldenke, and in addition, of his research work was passed.

Changes in the Constitution

A number of changes in the constitution of the association, submitted by R. A. Bull for the committee appointed at the first session to do so, were all approved by the meeting. They must now be submitted by a letter ballot to the association. They included the stipulation that associate members may not vote; that past presidents shall be members of the executive board of the association; that the vice-presidents shall not necessarily represent definite geographical districts, as this is sometimes difficult to do; that the executive board alone shall determine time and place of annual meetings.

To Standardize Core Binders

On motion of Dr. Moldenke it was voted that the president appoint a committee on the standardization of core binders.

An invitation to hold the 1915 meeting in San Francisco in connection with the Panama-Pacific Exposition was read. Invitations received to hold the next annual meeting in Chicago and in Milwaukee were referred to the executive board.

Safety in the Foundry

Two addresses, illustrated with lantern slides, brought the American Foundrymen's Association's 1912 meeting to a close. One of these was by W. H. Cameron, American Steel Foundries, Chicago, on "Accident Prevention and Safety Devices for the Foundry," and views, many of which have appeared in these columns, included an aluminum helmet for the operator when performing arc welding; aprons for grinding machine operations, etc. A physical examination is made of would-be employees and about 15 per cent. are rejected.

The other address covered the "Instruction in Foundry Practice at the Wentworth Institute," by Prof. E. A. Johnson, who announced that the school had now come into a $3,500,000 endowment, which ought to make it a large factor in industrial education.

Arrangements for Entertainment

To look after the many details of finance, reception, exhibit and general entertainment, the Buffalo members of the allied associations had appointed a general committee with H. D. Miles, president Buffalo Foundry & Machine Company, chairman. From the members of this committee were made up the special convention committees with William H. Barr, chairman of finance; W. F. Semon, of reception; T. L. Richmond, chairman of printing, badges and programme; Henry W. Wendt, chairman of exhibits, and Frank B. Baird, chairman of entertainment. The central feature of the entertainment was a subscription banquet on Thursday evening, though an equally enjoyable affair was a steamboat excursion down the Niagara River and around Grand Island with a stop at the blast furnaces of the Wickwire Steel Company, where the pig-casting machines were seen in operation. The company has two furnaces with a combined output of 350,000 tons of iron a year. Theater parties were provided for the ladies on Tuesday and Thursday evenings; the ladies were given a visit to the Roycroft shops and dinner at East Aurora on Tuesday morning, and an automobile trip for the ladies with luncheon at the plant of the Larkin Company was provided on Thursday morning.

At the banquet Hon. Charles Nagel, secretary of the Department of Commerce and Labor; Elbert Hubbard, East Aurora, N. Y., and John D. Wells of the Buffalo News were the principal speakers. Frederick C. Slee, an attorney of Buffalo, was the toastmaster. Mr. Nagel urged at length the wisdom of the development of the merchant marine and suggested that while this country was about to finish the Panama Canal all but us were ready to use it. Another topic he dwelt on was the trend to have the Government do everything for anybody who has not everything he wants. "A minimum wage without fixing the price of goods to be bought with it is," he said, "a humbug on its face. If the Federal Government is called upon to fix a minimum wage, you men must know that it is only a question of time when it will be called upon to fix the maximum to which any man is entitled."

Pittsburgh Foundrymen at Buffalo

The foundry interests of Pittsburgh were well represented at the annual foundry meetings in Buffalo. A special car was attached to a train leaving Pittsburgh on Monday, September 23, at 5:20 p.m. and it was occupied by the following travelers to the meeting: Arthur Williams Belden, Bureau of Mines; George England, superintendent foundry department, Edgar Thomson Steel Works; J. S. McCormick, J. S. McCormick Company; Frank D. Bumbaugh, Monessen Foundry & Machine Company; William A. Bole, Westinghouse Machine Company; Richard Muse, superintendent Marshall Foundry Company; George L. Brown, secretary and treasurer Marshall Foundry Company; H. W. Petty, works manager American Steel Foundries; J. S. McDonald, Hill Clutch Company; William J. Brant; Frank H. Zimmers, Union Foun-

Rosedale Foundry & Machine Company; Samuel R. Robinson, metallurgist Duquesne Steel Foundry Company; Theodore Woernley, McKinney Mfg. Company; Frank F. Elliot, Westinghouse Electric & Mfg. Company; C. H. Gale, superintendent foundries Pressed Steel Car Company; Samuel Wilkinson, Shelby Steel Tube Works; S. D. Sleeth, Westinghouse Air Brake Company; J. S. Seaman, Seaman-Sleeth Company; Robert A. Walker, *The Iron Age;* W. B. Robinson, *The Iron Age;* E. D. Frohman, S. Obermayer Company; D. G. P. Justice, Pittsburgh Valve, Foundry & Construction Company; O. C. Dobson, Carborundum Company; L. A. Way, Duquesne Steel Foundry; George T. Snyder, National Tube Company; J. W. Bumbaugh, superintendent McKeesport foundry, National Tube Company; R. M. Randlett, Sterritt-Thomas Foundry Company; Thomas Nichols and William H. Nichols, Seaman-Sleeth Company; T. E. Simpers, Westinghouse Electric & Mfg. Company; R. H. Donaldson, Franklin (Pa.) plant, American Steel Foundries, and a number of Pittsburghers having exhibits at the exhibition at the Broadway Arsenal, Buffalo. W. H. McFadden, formerly of Mackintosh, Hemphill & Co., Pittsburgh, and for many years active in the American Foundrymen's Association, and whose present headquarters are in Oklahoma, attended the meetings in Buffalo and was warmly welcomed by his many friends.

The American Institute of Metals

The meetings of the American Institute of Metals were held in the Hotel Iroquois, which was the headquarters of the Institute. The first session was held on Tuesday, September 24, at 2 p. m., with President L. W. Olson, Ohio Brass Company, Mansfield, Ohio, in the chair, and W. M. Corse, Lumen Bearing Company, Buffalo, N. Y., secretary. Mr. Olson congratulated the members on the large attendance and also on the interest they had taken in the work of the association in the past year, as was evidenced in the readiness with which members had furnished information to the various committees and by the large number of papers that had been prepared for the meeting this year.

The report of Secretary-Treasurer Corse was then read and was in part as follows:

Secretary-Treasurer's Report

The number of our members to July 1, 1912, which is the ending of our fiscal year, was 310, showing a net increase of 36 over last year, after taking out 13 members dropped for non-payment of dues. This shows that our association is having its usual normal healthy growth.

The standardization committee, of which your secretary is chairman, has to report that the standard rolled brass sample is practically ready for distribution through the Bureau of Standards, and that the sand cast sample is in process of preparation. This work naturally goes very slowly, but when finished is of great value.

The committee appointed during the year to co-operate with the Bureau of Mines is accumulating information and will report good progress. The committee appointed to co-operate with the Bureau of Standards will also be able to report progress along very satisfactory lines. It would seem that we made no mistake in starting out along the lines mentioned and that our Institute fills the need by supplying these Government bureaus with the practical information that they are in search of.

Your secretary has from time to time during the year made a special effort to watch the operations of other technical societies and is pleased to report that several suggestions which he has gotten have been put into effect. We are now selling copies of our transactions regularly to several libraries throughout the country and an effort will be made during the year to increase this list.

I want to express my appreciation of the splendid work done by our committee on papers, of which F. O. Clements is chairman. Our programme looks exceptionally strong this year and should make our transactions very valuable.

If the number of letters coming to the secretary's office is any indication of the interest of our membership, as well as the value of our Institute, it would seem that we are on a better footing at the present time than ever before.

Briquetting Brass Borings

The report of official chemists of the American Institute of Metals was the first technical matter considered and the discussion of it took up the greater part of the session.

The Ronay process for briquetting brass, bronze and other metal borings brought out a very interesting discussion as to results obtained by a number of foundries in this country that had tried to make a success of briquetting brass chips instead of melting them in a cupola and then of pouring into an ingot, this being the present practice. President Olson said that his company had experimented along the line and from their own plans had built a small press developing 3000 lb. pressure with an 8-in. ram and had successfully made briquettes from brass chips. These had been thrown on the floor and did not break and he believed that with more study in the building of a proper machine it could be done successfully on a commercial scale, their operations so far having been purely experimental. A representative of one of the largest brass foundries in the country said his concern had taken an ordinary testing machine and made a mould or cylinder with a plunger arranged to get pressure from both ends and had successfully made briquettes from brass chips and he believed it could be done in a commercial way with a considerable saving in costs over the present method of melting the chips in crucibles and then casting the ingot. There was quite a lengthy discussion on this subject participated in by nearly all those present.

A New White Metal

The discovery of a new metal during the past year by A. G. French, Nelson, B. C., was also fully discussed and the statement was made that a new white metal, now being successfully made by a concern in Connecticut, is destined to supplant steel, brass or copper for some special uses, such as automobile lamps, robe rods, etc., in automobiles. This metal is said to contain 50 per cent. copper, 35 per cent. zinc, 15 per cent. nickel and 2 oz. of aluminum to each 100 lb. of metal. The Pierce-Arrow Motor Car Company is using this metal, which it silver plates, and it is putting in a silver-plating outfit in its automobile works in Buffalo, intending in the future to furnish its cars with silver-plated or nickel-plated parts that are now furnished largely in brass.

Melting Aluminum

The question as to the best methods of melting aluminum for use in making aluminum castings was very fully discussed. E. S. Sperry stated that his experience was that the best results in melting aluminum were obtained by using a cast-iron pot, heated by an oil furnace, the precaution being used not to allow the flame to come in contact with the metal. Mr. Merritt stated that he had met with success in melting aluminum in graphite crucibles heated with producer gas. A Detroit brass founder reported that he had practically displaced crucibles and was using iron pots almost exclusively in melting aluminum and with better results. In answer to a question why hard spots frequently appear in aluminum castings melted in iron pots, it was stated that they are caused by the pots not being absolutely clean. When the liquid aluminum is poured from these pots part of the iron oxide in the pots comes along with it.

Prof. C. L. Parsons of the Bureau of Mines, Washington, D. C., addressed the meeting on "The Work of the Bureau of Mines as It Relates to the Non-Ferrous Metals." The Bureau of Mines is working in conjunction with a committee from the American Institute of Metals with the object of improving not only present foundry practices in making non-ferrous metal castings and the conservation of wastes now going on, but also with a view of bettering sanitary conditions in foundries and the general uplifting of the foundry trade. Dr. Parsons stated that recently the Bureau of Mines sent a list of 27 questions to brass foundries all over the country, the questions covering character of equipment, foundry practice, performance as regards amount of fuel in terms of the output, melting losses, etc., and also safety and sanitary provisions. He stated that the replies were fairly satisfactory, some concerns answering all of them, but he urged that the brass foundries represented at the meeting

that had not replied to these questions should understand that much ultimate good would come to the members by close co-operative work between the Bureau of Mines and themselves.

The Question of the Pyrometer

H. W. Gillett, Aluminum Castings Co., Detroit, Mich., at the session Wednesday morning, September 25, moved that a committee be appointed to work with the Government Bureau of Standards. It was also resolved that this committee use its efforts to have the Bureau of Standards eliminate the item of elastic limit in specifications for non-ferrous castings. President Olson announced that this committee would be appointed later. Prof. L. C. Parsons said that in his opinion the four most important matters that could be taken up between committees from the Bureau of Mines and the American Institute of Metals that would result in the most benefit to smelters of non-ferrous metals were as follows: 1—Development of a useful pyrometer. 2—Comparative tests of different types of furnaces under comparable conditions with a view to greater efficiency and the prevention of wastes. 3—Study of commercial alloys to obtain the desired physical properties in the most economical way. 4—Study of health conditions.

President Olson asked for discussion of these four topics in their order, and said that personally he favored the use of a pyrometer either placed permanently on the top of the furnace or when the heat was being taken from the crucible. One of the leading makers of pyrometers for iron and steel practice said that his company had spent a great deal of money in trying to make a pyrometer that would give accurate tests of temperatures in non-ferrous metal casting, but without success. He had traveled in Europe and investigated the subject there and found that none of the foreign makers had been able to design a pyrometer that would be reliable. In concluding the discussion President Olson asked that the members give the committee all the aid they possibly could, and if this was done he believed a pyrometer could be designed that would be reliable and could be made at a cost within the reach of the smallest foundries.

The Question of the Best Furnace

In taking up the second subject, Prof. Parsons stated that he believed the most valuable procedure regarding the types of furnaces to be used to secure maximum heating results with minimum costs would be to make comparative tests of two or more experimental furnaces, using oil, coke, coal or electricity for heat. After these tests had been concluded the results could be published and recommendation made as to the best types of furnaces to be used for each kind of work and the fuel used to secure lowest cost of operation. Prof. Parsons stated that the Bureau of Mines would recommend such furnaces only by general publication. It is probable that within the next year exhaustive tests will be made along these lines and the data gathered may be available at the next annual meeting. Several representatives of leading brass foundries stated they would be glad to go to the expense of building one or two experimental furnaces, so that these proposed tests could be made. Prof. Parsons also stated that for some time the Bureau had been making tests of different types of furnaces in the Pittsburgh district fired with producer gas, and these data are to be published by the Bureau in a short time.

W. R. Dean, Acme Windlass Company, said his company was building a new foundry in which oil furnaces were being installed, and that he would keep careful records of the heat costs of these furnaces after they are put in operation and would furnish the results to the Bureau. Mr. Sperry suggested that local conditions would probably largely determine the type of furnace to be used, and in his opinion the electric melting furnace will come more and more into general use on account of its advantages in the way of cleanliness, easy control of temperature and the fact that the price of electric current is more nearly stationary all over the country than other fuels, such as oil, coke or coal.

On the third question, the study of commercial alloys to obtain the desired physical properties at the lowest possible cost, Prof. Parsons stated that his Bureau already had investigations under way along this line and that the results would be available for the members of the American Institute of Metals in a short time. No discussion was had on this subject.

Sanitation in Brass Foundries

On the fourth question, the study of health conditions in the foundry, some interesting data were brought out. Prof. Parsons said that he had recently made visits of inspection to a number of brass foundries in different parts of the country and in some he found sanitation conditions almost ideal and in others they were bad. A number of founders present made interesting statements regarding equipment installed in their foundries for the improvement of general sanitary conditions. One delegate from York, Pa., stated that his city was the third largest manufacturing city in the State of Pennsylvania, and that the Manufacturers' Association of York had taken up extensively the subject of improved health conditions in manufacturing plants in York with good results. Wash rooms and bath rooms had been installed and medical examinations of the men employed in his foundry were made and also in other foundries in that city.

Mr. Schultz stated that two inspectors had gone through their plant recently and found conditions good. His company recently installed a large galvanized tub, in which the men wash their overalls and shirts at least once a week, and shower baths had also been installed for the use of their men. Mr. Moerel, of the brass department of the Pullman Company, Chicago, Ill., stated that his company compels the men to take baths regularly, and allows 10 min. at noon and 10 min. in the evening for them to wash themselves and take care of their clothes. The company has installed wash rooms, shower baths and furnishes tooth brushes free to its men and also a clean pair of overalls once a week.

The representative of a large foundry in Western Ohio, who requested that its name not be used, stated that health conditions in the company's foundries were the first consideration and were carefully observed at stated intervals. The shops were swept every day, individual shower baths have been installed, and the company furnishes towels and soap free to its men, and on account of the peculiar location of the foundry fans have been installed to furnish fresh air to the men. Every man before being employed must undergo a medical examination by the doctors of the company, and every precaution is taken to insure the very best health and sanitation conditions.

Some of the Papers Presented

Papers entitled "The Electric Melting of Copper and Brass," by C. A. Hansen, and "The Electric Furnace for Melting Non-Ferrous Metals," by G. H. Clamer and Dr. Carl Hering, were then read by title, and as the hour was late no discussion was had on these papers.

A paper entitled "Evaporation of Metals," scheduled for Wednesday, was read at the opening session on Thursday morning and was not discussed. A paper was then presented by G. H. Clamer, giving discussion on the paper entitled "Test Bars for Non-Ferrous Alloys," by Jesse L. Jones.

The paper entitled "Progress of Work on Boron Suboxide as Used as a Deoxidizer in Non-Ferrous Metals," by Dr. E. Weindraub, was presented by C. A. Hansen, General Electric Company.

A paper entitled "The Difficult Art of Casting German Silver," by C. P. Karr, was read by title.

Election of Officers

On Friday morning the election of officers was taken up. L. W. Olson, of the Ohio Brass Company, Mansfield, Ohio, was re-elected president, and W. M. Corse, Lumen Bearing Company, Buffalo, N. Y., was re-elected secretary-treasurer. It was recommended that in the future the editing of discussions of papers be handled by a publication committee and that this committee be instructed to cull out of all discussions all matter not absolutely essential to publication. President Olson announced that the executive committee has been holding one meeting between the annual meetings of the Institute, and that this committee will handle publication matters. The next place of meeting will be governed by the selection of the American Foundrymen's Association as to the place for its next annual meeting, and committees from the American Foundrymen's Association, the Foundry Machine & Exhibition Company and the American Institute

of Metals are to get together in the near future and decide on the place of meeting for next year. Later it was learned that Chicago had practically been selected.

The last business taken up was the election of vice-presidents, which resulted as follows: Vice-president of rolling mils, W. H. Bassett, assistant superintendent American Brass Company, Waterbury, Conn.; vice-president New England district, L. L. Belknap, Belknap Mfg. Company, Bridgeport, Conn.; vice-president Pennsylvania district, Jesse L. Jones, Westinghouse Electric & Mfg. Company, Pittsburgh; vice-president Illinois district excepting city of Chicago, Philip Mueller, superintendent H. Mueller Mfg. Company, Decatur, Ill.; vice-president Michigan-Ohio district, T. O. Clements, National Cash Register Company, Dayton, Ohio; vice-president Chicago-Wisconsin district, C. E. Hoyt, Lewis Institute, Chicago; vice-president Virginia and the South, G. H. Clamer, Ajax Metal Company, Philadelphia; vice-president New York and New Jersey district, F. Reidenbach, Genesee Metal Company, Rochester, N. Y.; vice-president Ontario and Western Canada, C. M. Ivy, Empire Mfg. Company, London, Ont.; vice-president Quebec, etc., Robert Job, vice-president of the Milton Hersey Company, Ltd., Montreal, Canada.

Chairman Gary on European Conditions

Judge E. H. Gary, chairman of the United States Steel Corporation, arrived in New York on the Olympic last week after an absence of 10 weeks. In an interview he said:

"Europe is in better condition than ever before. I am not speaking of the political or sociological conditions, but from a business and industrial standpoint. This is due to the actual thrift amongst the people. People are living better, spending more money, and everything points to marked improvement. Fifteen years ago in Italy, Austria and Germany you would see women doing most of the work in agricultural districts, and oxen doing the hard work on the farms. Today the women are supplanted by men, and modern up-to-date machinery has taken the place of oxen. I saw little evidence of poverty, but of course there is some in the cities.

"There is a feeling of unrest in the different countries, not confined to the working classes, but due to international activities. I hope to see all these difficulties smoothed over. No one can deny that all the nations are preparing for war. I would personally like to see less activity in this direction. There are many things in the manner in which European nations conduct their affairs that we might copy with profit."

Judge Gary commented favorably on the conduct of municipal government in Europe. The observance of law is marked. There has been great improvement in buildings. Highways are excellent. The United States has resources far greater than those of European countries, but this country he believed might well take pattern from Europe in some of these matters.

Republic Company Profit-Sharing.—The Republic Iron & Steel Company, Youngstown, Ohio, has had in operation for some time a profit-sharing plan in which certain classes of its employees are privileged to participate. It follows in some respects the lines of a similar system in effect among the employees of the United States Steel Corporation. A block of the common stock has been set aside for purchase by certain employees at $25 a share, payable in installments. Under plans now in view, a system will be worked out to apply more generally to employees of the company.

What is claimed to be the largest steam turbine driven centrifugal pump ever built in this country is to be installed by the De Laval Steam Turbine Company, Trenton, N. J., in the Ross pumping station of the Pittsburgh waterworks. The rated capacity of the unit is 100,000,000 gal. per day, against a total head of 56 ft., or more than 980 water horsepower. The pump is guaranteed to show a duty of 115,000,000 ft.-lb. per 1000 lb. of dry steam, all the steam used by the condensing equipment being charged against the main unit.

Taylor-Wharton Iron & Steel Company

The Taylor Iron & Steel Company announces the acquisition of William Wharton, Jr., & Co., Inc., Philadelphia, Pa., with works at Philadelphia and Jenkintown, Pa., and its subsidiary corporation, the Philadelphia Roll & Machine Company, the relations of the Taylor Company and Wharton & Co. having been so close that a unity of interests was deemed advisable. The corporate identity of William Wharton, Jr., & Co., Inc., and the Philadelphia Roll & Machine Company will be maintained, but dating from October 1, 1912, the corporate title of the Taylor Iron & Steel Company is changed to the Taylor-Wharton Iron & Steel Company. The organization of the Taylor Iron & Steel Company will be that of the Taylor-Wharton Iron & Steel Company, namely, president, Knox Taylor; vice-presidents, A. E. Borie, Prof. H. M. Howe, V. Angerer; secretary and treasurer, W. A. Ingram. The Taylor-Wharton Company will have a capitalization of $2,000,000 7 per cent. cumulative preferred stock, of which $1,500,000 will be issued at once; $2,000,000 common stock, of which $750,000 will be issued, and an authorized issue of $2,000,000 first mortgage sinking fund 6 per cent. gold bonds, which will mature in 1942, and of which $1,250,000 will be issued at once.

The Taylor Company and Wharton & Co. have each had successful careers of more than 50 years. During the past 18 years the business of each has been largely supplemental to the other in the manufacture and application of manganese steel. The Taylor Company has made a specialty of Tisco manganese steel castings which are particularly adaptable for use in railroad track parts, safes, vaults, conveyor chains, sprockets, special wheels, wearing parts of rock-crushing machinery and pumps, wearing parts of steam shovels and dredges and other parts of heavy-duty machinery subject to wear, abrasion or shock. Wharton & Co. manufactures switches, crossings, special rails and track parts for steam and street railroads, and has specialized in applying Tisco manganese steel to these purposes. A dividend of 3 per cent., payable October 10 to the holders of common stock of the old Taylor Iron & Steel Company of record September 24, has been declared.

Funds Short for Trust Suits

The Washington correspondent of the New York Globe, under date of September 26, says: "Department of Justice officials admitted today that prosecutions of trusts under the Sherman law are being greatly curtailed and that there is every indication of much less activity against alleged monopolies this fall and winter than last year. They complain that they are greatly hampered by the failure of Congress to grant them necessary appropriations fo continue the work. Last year the department spent $300,000 in prosecuting trusts. To meet this there was an appropriation of $200,000, and Congress granted a deficiency appropriation of $60,000 to make up the difference. The result is that the department still is in arrears. This year only $200,000 was appropriated, in spite of Attorney-General Wickersham's insistent demand that he be given more money for this work. The attorney-general may appeal to Congress at the next session for a special appropriation to push anti-trust cases."

The Walter H. Foster Company, 50 Church street, New York, has opened an office in the McCormick Building, Chicago, under the management of William Brewster, formerly associated with the Celfor Tool Company, and has arranged for the exclusive sale in that section of the product of the Baush Machine Tool Company, manufacturers of multiple and radial drills and Lassiter bolt machinery, and of the Quigley Furnace & Foundry Company, builder of furnaces for all industrial requirements and complete furnace equipments.

At a meeting of directors of the La Belle Iron Works, held in Steubenville, Ohio, last week, final steps were taken in the increase of the capital stock from $10,000,000 to $10,000,000 preferred and $10,000,000 common. The directors authorized an expenditure of about $200,000 for improvements, which include a 60-ton open hearth furnace, making 12 in all of this size, and a water purifying plant.

New High Speed Drilling Machine

A Number of Special Features Characterize the Latest Design of Baker Brothers

Rigid construction, powerful drive, the use of ball bearings throughout, a wide and powerful feed range, ease of operation, durability and economical production are the special features claimed for a new high speed high power heavy duty drilling machine which has been brought out by Baker Brothers, Post street and Westlake avenue, Toledo, Ohio. This machine, it is emphasized, marks a distinct advance in the design and construction of this type of machine tool. A view of the machine is given in Fig. 1, while details of the head with the gear guards removed are shown in Fig. 2.

As will be noticed from Fig. 1, the column is of box section the same as the 1-in. automatic drilling machine, which was illustrated in *The Iron Age*, March 28, 1912. The table, which is of the box knee type is heavily ribbed and has screw adjustments in all directions, micrometer collars being provided for the in and out and cross movements. It is pointed out that by the use of the screw arrangement much finer adjustments can be secured than are possible with a rack and pinion and in addition it is not necessary to lock the table in position after the adjustments have been made.

The spindle is a high carbon steel forging and the thrusts are taken on bearings having ¾-in. balls. Eight spindle speeds ranging from 35 to 351 r.p.m. are available, the changes being instantly secured by sliding gears which are controlled by a lever within easy reach of the operator. It is pointed out that there are no dive keys or tumbler gears in the driving train and the driving shafts are mounted on Hess-Bright radial bearings, all of which are inclosed in oil-tight cases. The vertical traverse of the spindle is 20 in. and the feed can be tripped at any desired point by the depth stop which is furnished. The feed changes, which are twelve in number, range from 0.006 to 0.032 in. per revolution of the spindle. Like the speed changes, these variations are secured by a powerful dive key and quick-change slip gears. The feeding mechanism is protected from injury by a safety device on the spindle feed shaft, which also gives uniform wear to all parts of the large worm gear. A special feature of the feeding mechanism is the addition of a quick change lever located within convenient reach of the operator that instantly steps any one of the twelve feeds up to one about four times as great when the machine is to be used for performing reaming operations. In addition to this feature, which can be used in connection with quick change collets, a hand lever feed and quick return are also provided.

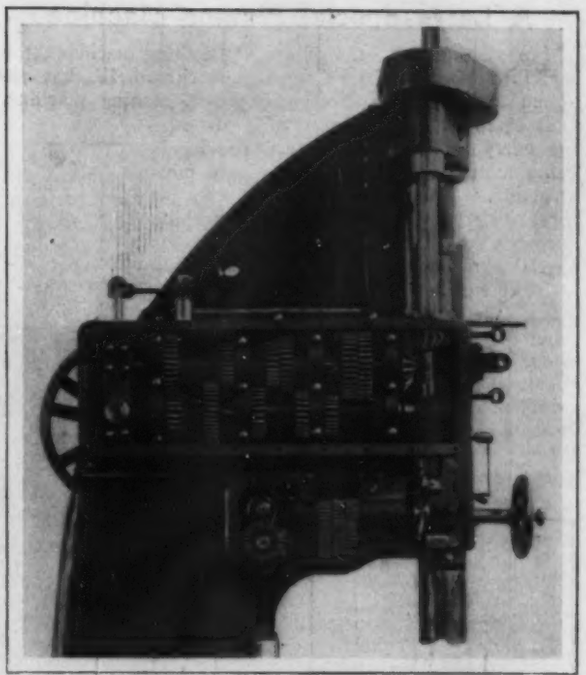

Fig. 2—Detail of the Head Showing the Gear Guards Removed

The capacity of the machine is 3-in. high speed drills in solid steel and the machine is driven by a 3½-in. belt running on a pulley 18 in. in diameter. This pulley, which is belted directly to the lineshaft, operates at a speed of 600 r.p.m. All the gears in the driving train except the large one at the top are of oil treated and hardened steel and run in a bath of oil. The arrangement of these gears is clearly brought out in Fig. 2, which shows the gear guards on the head removed. Hess-Bright ball bearings are used throughout the driving train, an arrangement which, it is pointed out, gives an efficient drive. As far as possible the number of gears in mesh at any one time has been made as low as is required to give the necessary speed changes and on the four direct speeds there are only three pairs of gears in mesh at any one time, while the maximum number engaged is only five pairs. All of the levers are centralized and are so arranged as to be convenient for the operator. The starting and stopping of the machine and all speed and feed changes are made from the front of the machine. The speed changes are controlled by two interlocking levers in such a way that it is possible to pass through the entire range, commencing with the slowest and building up to the fastest in a period of 8 sec.

The equipment furnished with the complete machine includes an oil pump, together with a tank and all the necessary piping.

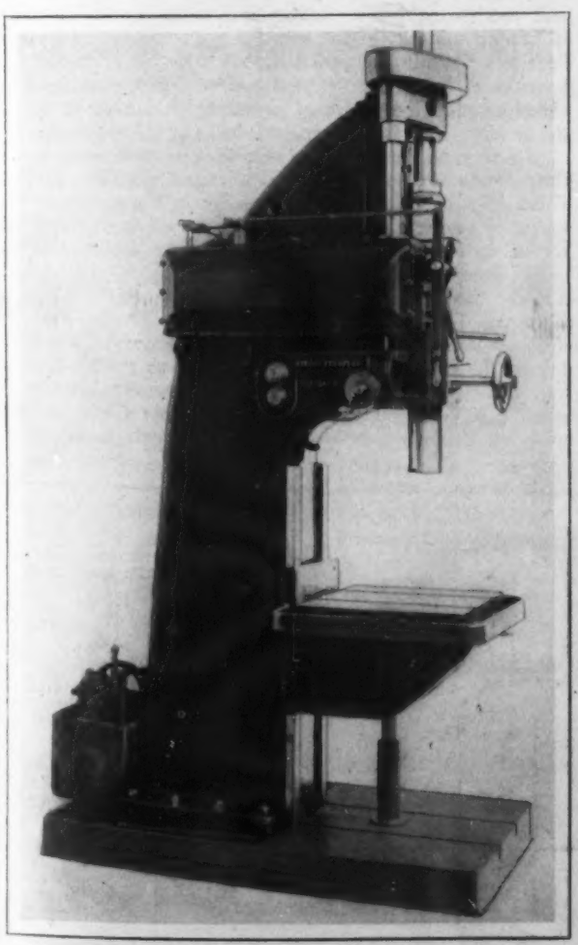

Fig. 1—The New No. 1½ High Speed Heavy Duty Drilling Machine Built by Baker Brothers, Toledo, Ohio

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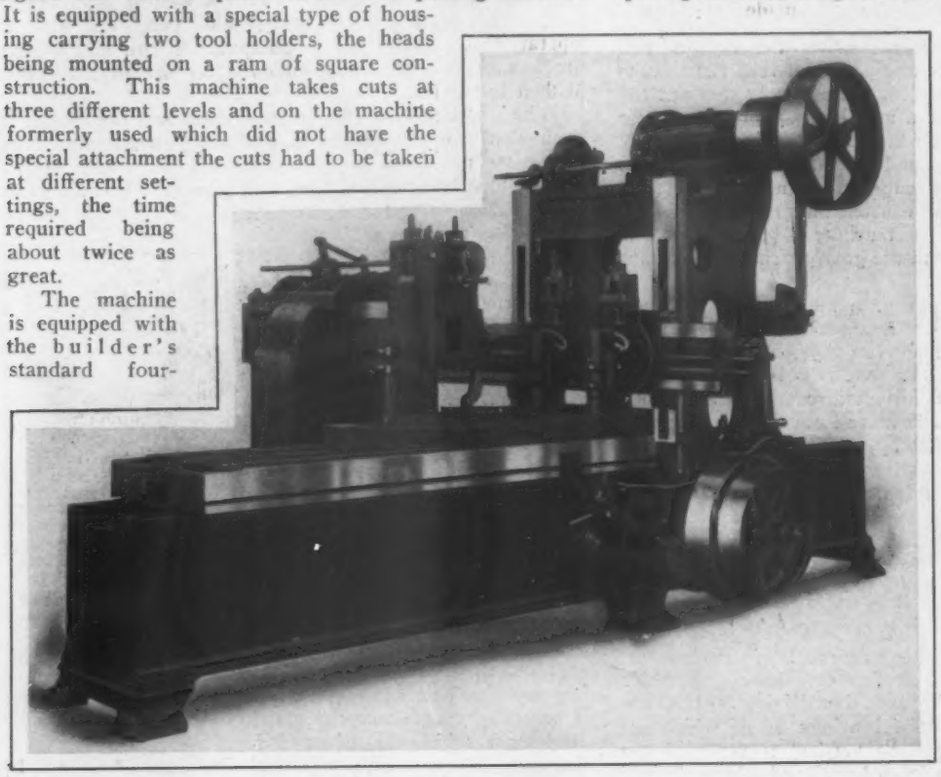
The Kerr Turbine Company, Wellsville, N. Y., has found it necessary to open an office of its own in Pittsburgh, to take care of increased business in that district. It will be located at 2137 Henry W. Oliver Building, and will be in charge of R. M. Rush, who was formerly with the Dravo-Doyle Company. F. B. Allen, formerly with the Cleveland office of the Cooper-Hewitt Company, will be associated with Mr. Rush.

An advance in heating boilers and cast-iron radiation was made Monday, 5 per cent. in the latter case.

A Large Special Planing Machine

For planing the bases of upright drilling machines, the Rockford Machine Tool Company, Rockford, Ill., has designed and built a special 28-in. x 8-ft. planing machine. It is equipped with a special type of housing carrying two tool holders, the heads being mounted on a ram of square construction. This machine takes cuts at three different levels and on the machine formerly used which did not have the special attachment the cuts had to be taken at different settings, the time required being about twice as great.



A 28-In. x 8-Ft. Special Planing Machine Built by the Rockford Machine Tool Company, Rockford, Ill.

The machine is equipped with the builder's standard four-speed drive, giving four different cutting speeds with a constant return. The machine is arranged for belt drive, directly from the lineshaft, the usual countershaft being omitted. The feeds for the head are driven from a friction at the rear of the machine mounted on the intermediate shaft. The feeds are operated and reversed by the trigger gear located at the front of the head within easy reach of the operator.

The operations performed by this machine are the planing and finishing of the flat T-slotted base with the two heads on the regular cross rail. While this is being done the rear head on the special attachment machines the top of the hub for supporting the column, while the front head planes the pad for the outer bracket at the rear of the base.

The contract for the new engine house, machine shop, etc., of the Manufacturers' Railway at St. Louis, let to the G. Hartmann Contracting Company, involves about $75,000 for the building and some $175,000 for machinery, tools, etc. The Christopher & Simpson Architectural Iron & Foundry Company has the steel work. A transfer table and a traveling crane of large capacity will be installed. The machine shop will include lathes, drill presses and other machinery required in the repair of engines. The power plant will include Diesel engines of the type to be built by the Busch-Sulzer Bros.-Diesel Engine Company, now constructing a large plant in South St. Louis. The tools will all be electrically driven. The railroad company has also ordered six new engines.

An Improved 20-In. High Speed Lathe

Several improvements have been made by the Reed-Prentice Company, Worcester, Mass., in its 20-in. high-speed geared head engine lathe. The design of the driving pulley and its bearings has been materially changed, thus eliminating the friction due to the necessarily high tension of the heavy double belt which is required to perform the duties demanded by high speed steel cutting tools. As compared with the former design, the positions of the pulley and the driving gears have been transposed. Fig. 1 is a general view of the lathe, while Fig. 2 gives details of the headstock reversing mechanism.

Formerly the gears were at the end of the shaft with the bearing outside bolted to the headstock. The hood *a*, Fig. 2, protecting the reversing mechanism and forming the bearings and the brackets *b* are now cast integral with the headstock, a construction of the most rigid form. The flanged pulley is mounted at the end of the spindle, ball bearings of the double purpose type being used to provide for both the radial and end thrust loads. Offset spokes in the pulley bring its center and that of the belt directly over that of the ball bearings. While the possibility of wear occurring in the bearing is rather remote, at the same time means are provided to take it up if that necessity should arise. High grade alloy steel is used for the balls in the bearings.

To prevent the belt from becoming soaked with oil and thus losing its pulling power, a raised diameter is provided at *c* on the hub of the pulley in the center of the recess in the bearings. This causes the oil to drip into the recess rather than to work along to the spokes and the pulley face and thence to the belt. The design for mounting the intermediate bevel gear gives a very substantial support. Whatever tendency may exist for the bevels to crowd apart under working loads is resisted by the bearing of the intermediate gear at *d* close to the bevel faces and directly opposite the line of pressure. The thrust piece *e* is made oil tight so that the hole *f* can be filled with oil from which it will flow through holes drilled

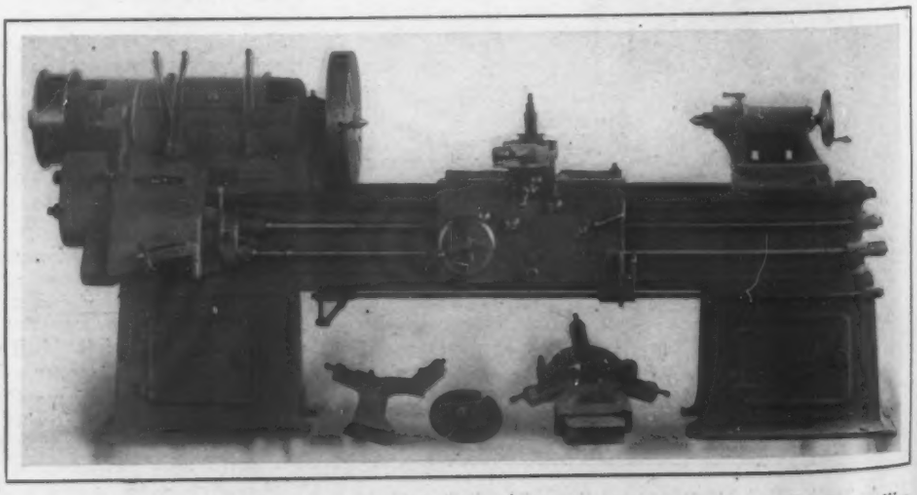


Fig. 1.—The Improved 20-In. High Speed Geared Head Lathe Built by the Reed-Prentice Company, Worcester, Mass.

in the hub, thus lubricating the running parts. In addition the oil acts as a cushion between the walls and to a great extent eliminates metallic vibration between the revolving parts.

The headstock as a whole has been made heavier than

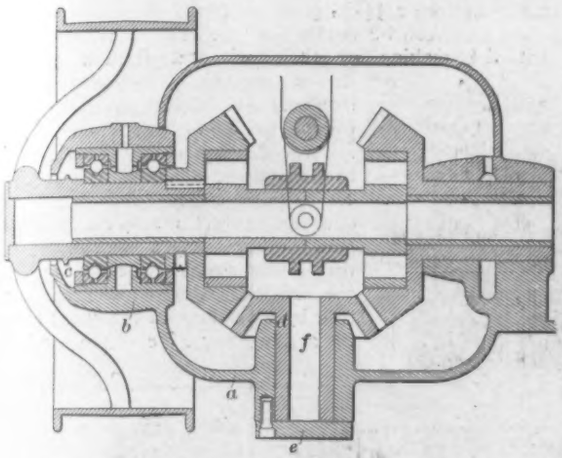


Fig. 2—Details of the Headstock Reversing Mechanism

before and contains various minor improvements, including a new arrangement for taking care of the centrifugal force of the friction fingers. This arrangement removes the tendency to open the friction at high speed and cause it to drag in its cup.

If desired the tool can be equipped for motor drive, as motor attachments of any size or make are easily applied to this type of lathe, the motor being fastened to a vertical adjustable bracket on the rear of the leg. A mechanical attachment provided with the bracket gives any desired degree of belt tension.

Colorado Fuel & Iron Company's Earnings

The report of the Colorado Fuel & Iron Company for the fiscal year ended June 30, 1912, shows a surplus after charges of $1,801,228, an increase of $541,556 over 1911 and a gain of $294,409 over 1910. The income account compares as follows:

	1912	1911	1910
Gross earnings	$24,268,452	$22,934,685	$23,639,813
Expenses	20,496,171	19,456,336	19,897,197
Net earnings	$3,772,281	$3,478,349	$3,742,615
Other income	676,693	671,599	626,919
Total income	$4,448,975	$4,149,948	$4,369,534
Charges	2,647,746	2,890,276	2,862,716
Surplus	$1,801,228	$1,259,672	$1,506,819

The special meeting to extend the company's charter has been called for October 19. The regular annual meeting will be held October 21. At the latter meeting the proposition to recapitalize the company will be taken up. The new financial plan, according to interests of the company, will be exceptionally beneficial to both preferred and common stockholders. It will consist probably of a rearrangement of the bonded indebtedness.

The Cleveland Machine & Mfg. Company, Cleveland, Ohio, which recently purchased a site for a new plant, has decided to defer building operations and will increase the capacity of its present plant. A portion of its main building is being rebuilt on a larger scale to provide machine shop floor room space of 65 x 340 ft. In this a 25-ton crane will be installed. An order for the crane has been placed with the Alliance Machine Company, Alliance, Ohio. The company is at present crowded with work. It has recently taken orders for two open-hearth furnaces for the Lackawanna Steel Company, this order being in addition to a similar one previously noted. It has also taken an order from the Tennessee Coal, Iron & Railroad Company for cambering machines. It has added a line of hydraulic presses to its other products, and about January 1 will bring out a line of electric industrial cars and locomotives.

New Vertical Centrifugal Pump

The latest addition to the line of centrifugal pumps developed by the Goulds Mfg. Company, Seneca Falls, N. Y., is a vertical unit for service where it is necessary to pump from a pit. If desired this pump can also be operated submerged. The pump is of the single-stage single-suction type and is intended for use in connection with a belt drive.

The impeller is of the inclosed type and the design is such that the end thrust is practically negligible. The vanes are machined to give a smooth finish and have a form which, it is emphasized, will give the maximum efficiency at normal rating. The shaft is of high carbon open-hearth steel, machine finished, and the bearings, which are bronze bushed, are carried in a yoke bolted, to the top cover. Grease cups are provided for lubricating them. The end thrust within the limits of head for which the pump is designed is practically negligible and the weight of the impeller and the shaft is carried on a ball thrust bearing. The stuffing box has a brass water sealing ring which prevents air from entering the pump and makes it unnecessary to draw the gland up tight. In this way, it is pointed out, low friction loss and cool operation are insured.

A New and Improved Type of Vertical Centrifugal Pump Built by the Goulds Mfg. Company, Seneca Falls, N. Y.

Six sizes of pumps are built and the following table gives the principal dimensions and specifications:

Pump No.	3	4	5	6	8	10
Size of discharge pipe, in.	3	4	5	6	8	10
Size of suction pipe, in.	3	4	5	6	8	10
Rated capacity per minute, gal.	270	470	750	1,050	2,000	3,000
Diameter of driving pulley, in.	6	7	10	12	14	16
Face width of driving pulley, in.	7	7	10	12	14	14
Domestic shipping weight, lb.	140	185	300	550	800	1,300

When the pumps are intended to be used for handling liquids which attack iron they can be furnished either with brass fittings or made entirely of brass. The equipment furnished with the pump includes a short shaft extension, a discharge elbow, one jaw coupling and a standard pulley. If desired the pump can be furnished arranged for direct connection to an electric motor or any other type of prime mover, the necessary bearings, shafting and coupling being provided.

New German Method of Galvanizing

The Frankfurter Zeitung, according to Vice-Consul-General William Dawson, Jr., Frankfort, Germany, gives the following description of a new method of galvanizing iron:

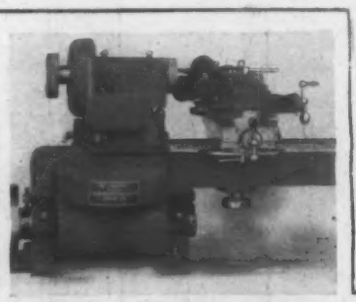
"In order to protect iron objects from rust it is customary to coat them with zinc, either electrolytically or by plunging them in a bath of melted zinc after careful cleansing, but a real fusion of the two metals is not thus obtained. A recently patented process consists in so preparing the iron that the zinc gets into its pores. After steeping in sulphuric acid, the iron is placed in a solution of mercury chloride and then heated, resulting in decomposition of the mercury chloride and precipitation of metallic mercury, which forms an amalgam with the iron on the surface. The iron is then plunged into a zinc bath heated to 500 deg., where it remains three minutes. Iron galvanized by this process shows unusually strong adhesion of coating to metal. Microscopic investigation shows that the zinc penetrates the iron and in case a portion of the coating is worn or broken off the iron does not rust."

The Marine Welding Company, Buffalo, N. Y., with a capital stock of $150,000, has been incorporated to take over and continue the business of the General Welding Company, which now has plants at Buffalo, Cleveland and Milwaukee. The existing plants will be enlarged and new equipment added. The general offices of the company are at 36 Illinois street, Buffalo. H. G. Smith is president; Charles D. McGee, secretary and treasurer, and Lance Nicholson, general manager.

Lathe Grinding Attachment

A Device for the New Swiveling Head Cincinnati Precision Lathe

Among the recent developments of the Cincinnati Precision Lathe Company, Cincinnati, Ohio, are a universal or swivel head lathe and a combination internal and external tool post grinding attachment. These two are designed to be used in conjunction with each other and when so arranged both face and angle grinding can be readily handled. The special features of the lathe are the elimination of cone pulleys and the ability to transmit power to the driving pulley from above, below or in back of the lathe. Fig. 1 is a view of the lathe with the grinding attachment in position for face grinding and Fig. 2 shows the position of the attchment for angle grinding. A rear view of the lathe is given in Fig. 3, while details of the clutch controlling the spindle movement are given in Fig. 4.



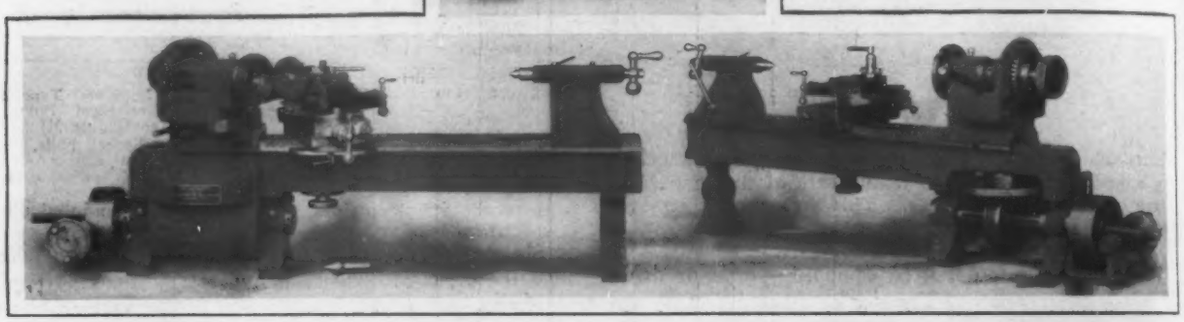


Fig. 1—Front View Fig. 2—Arranged for Angle Grinding Fig. 3—Rear View
Three Views of a New Swivelling Head Lathe and the Lathe Grinding Attachment Made by the Cincinnati Precision Lathe Company, Cincinnati, Ohio

In general appearance and construction the new tool is the same as the friction-driven precision bench lathe, which was illustrated in *The Iron Age*, May 2, 1912. This type of construction eliminates the cone pulleys and this, it is emphasized, permits the use of practically continuous spindle bearings which will not get out of adjustment since there is no belt pull or other strain on the spindle. All of the speeds in both directions are obtained by the friction mechanism described in connection with the earlier type of tool. The wear between the friction members is taken up by eccentric bushings which are so arranged that the friction driving shaft can be raised or lowered parallel with the face of the driven disk. The headstock of the lathe is of the universal or swivel type with a reading at the back of the head and can be located in any desired angle by an eccentric bolt at the back and a hardened bolt in front. A hardened and ground circular ring inserted in the upper base and fitting accurately in a circular slot in a plate which is bolted to the lathe bed maintains the circular accuracy of the head. The location of the belt pulley permits the power to be applied from below the bench or from a countershaft attached to either the sidewall or the ceiling. From the driven friction disk the power is transmitted by a vertical spindle which drives the lathe spindle through a pair of miter gears. There is a ball thrust collar bearing between the horizontal friction disk and the lathe bed and the miter gears run in oil.

The use of this swivel head in connection with a combination external and internal tool post grinding attachment and a double swivel slide rest converts the tool into a combination universal precision grinding machine and lathe. Fig. 1 shows the lathe attachment arranged for face grinding which is done by placing the lathe lead on 30 deg. and each swivel of the rest on 30 deg., making the required angle of 90 deg. The attachment may be driven from beneath the bench if preferred, as shown in Fig. 3. The combination countershaft with an automatic belt tightener for driving both the lathe and the grinding attachment is provided for sidewall or overhead drive as may be desired. The position of the lathe and the attachment for angle grinding is shown in Fig. 2.

The lathe has an 8-in. swing and the bed is 32 in. long. The distance between centers is 15 in. The driving pulley operates at a constant speed of 1000 r.p.m. and gives a speed range of 350 to 2500 r.p.m., the changes being secured by shifting the driving friction across the face of the driven wheel.

It is claimed for this arrangement that slow speed and high power are obtained at the outer edge of the disk and if desired a ⅞-in. piece of round machinery or cold-rolled steel can be reduced at one cut. It is pointed out that the making of the horizontal friction disk the driven member eliminates friction trouble. If the machine should be overloaded and the friction made to slip the driving wheel would continue to revolve with uniform wear. A special type of clutch which enables the operator to start or stop the spindle instantly at any speed is provided. As the friction driving wheel is located at the desired point on the horizontal disk by a reading on the speed indicator at the outer edge of the hand-control wheel, the main spindle is engaged instantly at the desired speed by a downward pressure of the clutch lever while a movement in the opposite direction releases it immediately. In this way it is emphasized that no countershaft is required for operating the lathe, thus providing a self-contained lathe and countershaft. For the operation of the grinding attachment a combination countershaft for driving both the lathe and the grinding attachment is employed.

The mechanical construction of the control clutch is brought out in Fig. 4. The weight of the large lever handle is balanced by a small spring on the outside of the head which causes the fork to float in the lifting slot in a hardened tapered member. This arrangement, it is pointed out, obviates wear and when the tapered member is raised it forces four hardened pins outwardly against a split ring. This in turn is forced against the wall of the

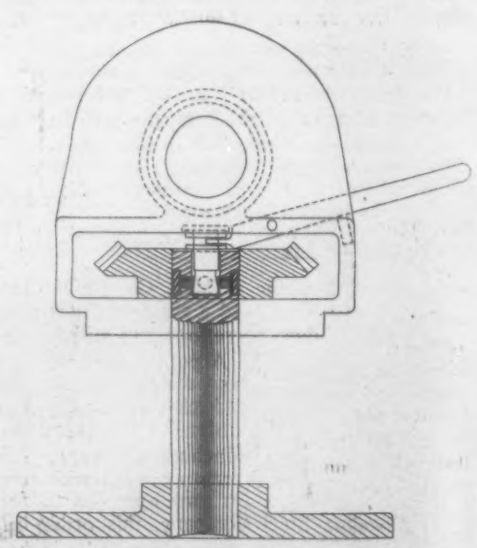


Fig. 4—Details of the Control Clutch

miter gear and positively engages it with a very slight pressure on the hand lever. When the split ring is in its release position it is slightly undersize and there is no friction. On becoming engaged all the working parts of the clutch are carried with the gear and vertical spindle and as the lever floats in its slot it is pointed out that the tendency to wear is reduced to such a minimum that the life of the clutch will equal that of the lathe. The location of the clutch handle being so convenient to the natural position of the left hand of the operator, it is claimed that the machine is started and stopped at any desired speed more quickly than can be accomplished by any other form of foot treadle control. The lubrication of the clutch mechanism is constant and it is pointed out that it will always engage the gear so as to retain it in perfect alignment, the clutch application being positive, uniform and powerful.

Another means for starting and stopping the lathe independently of the driving belt is provided by a slight depression in the center of the horizontal friction disk. When this method is employed the entire machine comes to rest except the driving friction shaft, which in this case acts as a self-contained countershaft to the main spindle.

New Power Forging Hammer

For general forging work Beaudry & Co., Inc., 141 Milk street, Boston, Mass., have recently brought out a new type of hammer designated as the Peerless power hammer. While general forging work is the field for which this tool was especially designed, it can also be used for plating and drawing steel in the manufacture of edge tools, cutlery and files for shovel, agricultural implement, spindle and general tool making and in all forging operations where extreme quickness of the blow is a requisite. It is intended for continuous service and can be operated at a high rate of speed. Front and end views of the tool, together with one of the hammer mechanism, are given in the accompanying engraving.

This hammer, like the builder's Champion type, has no beam, coil springs, leather straps or rubber cushions, all the working parts being of steel, as will be noticed from the view in the upper portion of the accompanying engraving. The ram is connected with the spring arms through two long steel links which, while arranged to occupy a small amount of space, give, it is emphasized, at the same time great freedom and lift of the ram and impart through the spring arms an elastic, cushioned and powerful blow. Tension nuts in the spring box adjust and maintain the tension on the spring arms and links.

The hammer is stopped, started and regulated by a foot treadle extending around the base of the machine. By varying the pressure upon the treadle, any desired speed or force of blow can be instantly obtained, the treadle working in connection with the belt tightening pulley and friction band brake. The pulley is of large diameter and wide face, an arrangement which gives the belt a large area of contact and causes the hammer to respond to a slight pressure on the treadle. The idler pulley and the brake band are reversible and can be attached to either side of the driving pulley through lugs, so that the hammer may be run in either direction as may best suit the customer's requirements.

The anvil is a separate casting, flanged at the bottom for bolts and a wood filler is used between it and the frame to eliminate vibration. In the front view, in the lower left-hand corner of the accompanying engraving, the anvil is shown secured to the frame by strap bolts, which is an additional method of fastening it in place. It is offset so as to clear the main frame casting, thus permitting any length of bar to be worked either way of the dies. An independent adjustable shoe die is also furnished with the anvil.

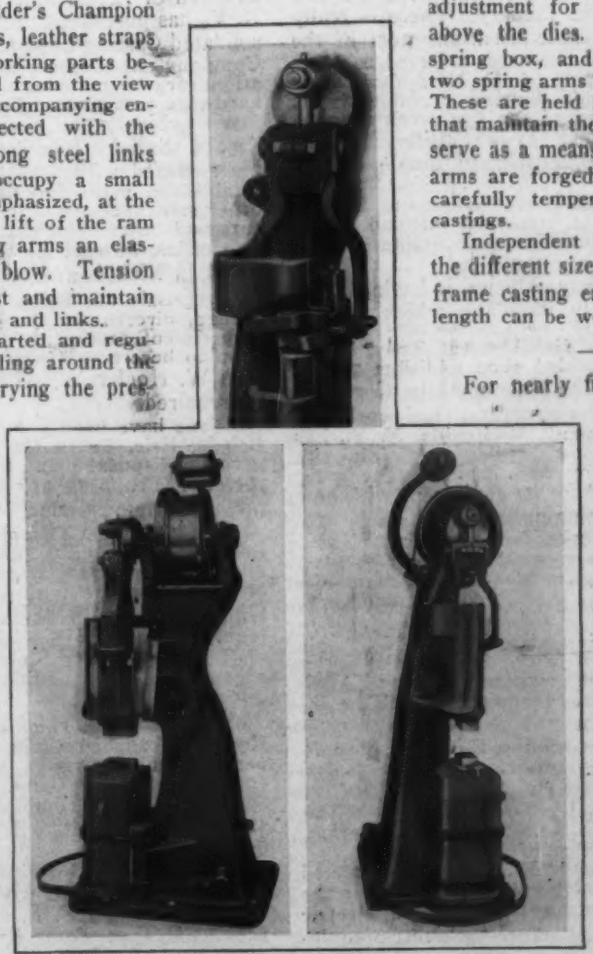
The frame, which is a one-piece casting, is very rigid and occupies only a small amount of floor space. Steel is employed for the ram, which is machined and fitted into heavy V-shaped guides. It is adjustable on its connecting rod for varying hights above the dies and is almost entirely contained within the guides at all times, an arrangement which it is pointed out insures perfect alignment of the dies and a square and true blow. The ram guides are heavy and are cast solid with the frame. For taking up wear an adjustable composition tapered gib is fitted to one of them.

The following table gives the principal dimensions and specifications of the seven sizes of hammer:

No. of hammer	1	2	3	4	5	6	7
Weight of ram, lb.	25	50	75	100	125	150	200
Lift of ram, in.	5	5½	6	6½	7	7½	8
Average size of work, in.	1	1½	1¾	2¼	2½	3	3½
Speed of hammer, strokes per minute	400	350	325	300	300	275	250
Diameter of driving pulley, in.	15	15	16	16	16	17	18
Face width of driving pulley, in.	4	3	5	5½	5½	6	6
Hight to center of shaft, in.	63	66	68	71	73	76	81
Size of dies, in.	6x3	6½x3¼	6½x3½	7x3½	7x3½	7x3½	8x4
Approximate weight of hammer, lb.	1,200	2,000	2,400	3,000	3,200	3,700	4,400

The large diameter steel crankshaft runs in a long bearing having a babbitted bushing which is chambered for the lubricating oil. The crank pin, which is a steel casting of ample dimensions, can be adjusted for varying lengths of strokes. The connecting rod, which is made of steel, runs in a hard bronze sleeve which is also recessed for the lubricant. It is keyed to the spring box and provides the adjustment for the ram for various hights above the dies. Steel is employed for the spring box, and there are fitted into it the two spring arms to which the links are hooked. These are held in place by two tension nuts that maintain the tension on the arm and also serve as a means of adjusting it. The spring arms are forged from Swedish steel and are carefully tempered, and the links are steel castings.

Independent anvils are furnished for all the different sizes, the anvils clearing the main frame casting each way so that bars of any length can be worked either way of the dies.



The Hammer Mechanism.

Front View. End View.

Three Views of a New Power Hammer Built by Beaudry & Co., Inc., Boston, Mass.

For nearly five years Castings, edited by Robert I. Clegg and published by the Gardner Printing Company, Cleveland, Ohio, has maintained an important place as a monthly journal of the foundry trade. In the September issue it is announced that hereafter it will appear in pocket size, 4 by 6¼ in., and will be issued free, being "exclusively devoted to the advertising that is of particular value to owners and operators of foundries and pattern shops."

The Pennsylvania Railroad is waging an active campaign to get the greatest possible service out of its freight cars. Approximately 27,000 employees are engaged in its shops on rush orders to put all cars and locomotives in good shape and to get them out.

The Machinery Markets

Trade continues good. Without developments of especial note there has been since the last report a general steady movement of machinery. All centers have done well and there is no indication of any subsidence of activity; in fact, with so much forward momentum, due to widespread and deep seated causes, there cannot well be any sudden slump. The general demand continues good in New York. Philadelphia has had a better run of orders, especially from outside territory. In Baltimore business is improving and there are some good inquiries before the trade. The New England metal trades are busy, some of them to full capacity. September's volume of trade exceeded that of August in Cleveland and the outlook is good. There appeared to be a little slackening up in Cincinnati in the last week, although export trade was good and a scarcity of labor was reported. Detroit found September a better month than August and inquiries are plentiful. Railroad buying continues to distinguish the Chicago market, new lists having come before the trade, while industrial buying has been good. Dealers in St. Louis are well satisfied with the month's business. Inquiries, especially for mill equipment, are coming out freely in the South. Texas conditions are unusually good, the proceeds from the large cotton crop serving to stimulate all branches of trade. In this state the only unsatisfactory feature is the shortage of cars. Fairly general buying has been felt over the Pacific coast territory where the lumber industry, responding to heavy demand, is creating activity in other lines, such as iron working equipment, hoisting machinery and extensions to railroads.

New York

NEW YORK, October 2, 1912.

Activity in the month of September proved satisfactory in the New York machinery market as was predicted, the volume of business transacted by many houses not having been exceeded in any corresponding period for many months back. The trade is still awaiting the closing of some of the larger inquiries of recent date while new ones less striking as to size have continued to come along. The list of the General Electric Company is not yet entirely disposed of but is expected to be closed up in a week or ten days. The trade is anticipating the requirements of the General Vehicle Company for its new factory addition in Long Island City. Some of the requirements of this company have already been made known, although the buying of the greater part of the equipment will not be undertaken until early in January. There is really little change in the local trade situation, most of the demand having the general character referred to heretofore. The railroads outside of the New York, New Haven & Hartford are not figuring prominently as purchasers. Among buyers of the last week may be mentioned the International Type Setting Machine Company, Brooklyn, which purchased nine 4-spindle sensitive drills.

The plant of the Ernst Wiener Company at Easton, Pa., for the manufacture of industrial railroad equipment, is installing new machinery including cranes, punches and shears, pneumatic tools, etc.

The Albany Felt Company, Albany, is having plans prepared for an addition to its plant, which will be built at once.

H. G. Hammett, 476-480 Eighth street, Troy, N. Y., has let contracts for a machine shop addition, 75x110 ft., two and three stories. The Mahoney Mfg. Company received the contract for the structural steel work.

The Andover Silk Company, Whiteville, N. Y., has purchased the concrete factory building adjoining its plant, formerly occupied by the Andover Stamping Company, and has arranged for its equipment with new looms, warpers, winders, spinning machines, etc.

The Onondaga Paint Works, Inc., Onondaga, N. Y., has been incorporated with a capital stock of $125,000 and will equip a plant for the manufacture of paints, varnishes, etc. J. H. Burke, D. W. Schubert and C. V. Byrne, Syracuse, N. Y., are the directors.

The Perry Knitting Company, Perry, N. Y., is building a new storage dam in the Silver Lake outlet which will add 500 hp. to the company's factory. Additional electrical and machinery equipment will be installed.

The Price Fire & Waterproofing Company, Poughkeepsie, N. Y., has been incorporated with a capital stock of $375,000. It will build and equip a plant for the manufacture of compounds for fireproofing and waterproofing. W. S. Price, F. S. Lown and H. C. Barker, Poughkeepsie, are the directors of the company.

The village of Springfield, N. Y., has completed arrangements for an issue of bonds to provide for the installation of an electric power plant. An electric generator, gas engine and all requisite electric equipment will be purchased.

The Borden Condensed Milk Company has purchased a site of six acres at Sinclairville, N. Y., on the Dunkirk, Allegheny & Pittsburgh Railroad. The company plans to erect at once a plant of brick and stone, 60 x 200 ft., in which it will duplicate the equipment of its present plant at Randolph, N. Y. This company has also recently purchased the plant of the Powdered Milk Company of America at Sherman, N. Y., and will continue its operation with increased equipment.

The Adirondack Power Corporation, Saratoga, N. Y., has completed plans calling for an expenditure of $500,000 for the enlargement of its plant at Spier Falls and other improvements.

The city of Jamestown, N. Y., will issue $300,000 in bonds for the purpose of improving the municipal water works. The Board of Water Commissioners is at present receiving bids for 275 lengths of 24-in. and 450 lengths of 16-in. cast iron pipe.

The Deed & Lynd Mfg. Company, organized by A. P. Deed of Albany and L. E. Lynd of Mechanicsville, N. Y., has purchased the plant and business of the Consolidated Casting Company—formerly the W. F. Greene Company—at Mechanicsville and will continue its operation for the manufacture of stove trimmings, piano-hardware and similar lines of products. Considerable new machinery and equipment will be added.

The Buffalo Resilio Company, Buffalo, has been incorporated with a capital stock of $25,000 and will establish a plant for the manufacture of resilio and other substances used in the making of tires for motor cars and other vehicles. The incorporators are Henry B. Collins, Samuel L. Welch, David L. Thorpe, Raymond L. Nichols and others of Elmira, N. Y.

Proposals are being received by Dr. Whitman H. Jordan, director of the New York State Agricultural Experiment Station at Geneva, N. Y., for a carpenter shop to be erected from plans of State Architect Herman W. Hoefer, Albany. Considerable equipment will be required.

Plans have been completed by City Engineer B. E. Briggs, Erie, Pa., for a two-story brick and concrete garbage disposal plant to be erected and equipped by the city. Proposals are being received by the chairman of the Common Council.

The Mulhauser Company, Albany, has been incorporated with a capital stock of $25,000 to manufacture shoddy, yarns, etc., and a plant will be built and equipped for the purpose. F. Mulhauser, Cleveland, Ohio, and S. and R. Mulhauser, New York City, are the incorporators.

The Forbes Dry Plate Company, Rochester, has let a contract for an addition to its factory, 50 x 100 ft., one story.

W. J. Backes, chief engineer of the Central New England Railroad Company, Hartford, Conn., is preparing plans for repair shops and round house to be constructed at Highland, N. Y., at an estimated cost of $2,000,000. When completed the shops now at Hartford and Danbury, Conn., will be transferred to and consolidated at Highland.

The Herkimer Furniture Company, Herkimer, N. Y., recently incorporated with a capital stock of $50,000 by T. F. Cahill and S. F. Peavey, New York City, and C. C. Gates, of Toms River, N. J., has completed arrangements for its manufacturing plant.

Plans are being prepared by Engineer Joseph Kemper, Utica, N. Y., for a sewage disposal plant to be constructed at Oneida, N. Y.

The city of Geneva, N. Y., has awarded general contract to the Dollard Construction Company, Syracuse, for the erection of a boiler house at the pumping station. Work has been commenced on the building which will be 42 x 39 ft., one story.

The Julian Motor Company, Syracuse, N. Y., has commenced construction of its new plant for the manufacture of auto motors and marine motors.

The Genesee Valley Distilling Company, Rochester, N. Y., has been incorporated with a capital stock of $25,000, and will build a distilling plant. C. E. Burnette, F. T. Jensen and J. A. Murphy, Rochester, are the directors.

New England

BOSTON, MASS., October 1, 1912.

The feeling that prosperity is really here, which has characterized the past few weeks, continues to pervade New England. The metal trades are busy, many of them to practically their limit of production, all of them well beyond what they were doing earlier in the year. While New England machine tool dealers are not personally deeply interested in business placed by the Harlem division of the New York, New Haven & Hartford Railroad the news of the list recently sent out, representing some $100,000 in machinery, is pleasurably received. The big list of the Boston & Maine for the Billerica shops has not been received.

The Hart & Hutchinson Company, New Britain, Conn., is organizing to manufacture steel doors and trim, steel lockers, etc., and will take over the locker business of the well known house of Hart & Cooley Company. N. P. Cooley is the president, M. S. Hart vice-president and Guy Hutchinson secretary and treasurer of the new company, which will erect a plant, but details as to the site and buildings are not perfected. The Hart & Cooley Company established its locker department about eight years ago and the growth has been constant and healthful until the volume has become so great as to make the line cumbersome with existing facilities. Therefore it was decided to establish an industry for a more specialized purpose, and the new plant will be designed for a larger production and naturally decreased costs. The purpose is also to develop the manufacture of steel doors and steel molding. The buildings now occupied by the Hart & Cooley Company for the locker department will be used for the manufacture of steel medicine or bath room cabinets and for other specialties not yet developed. Mr. Cooley, president of the Hart & Hutchinson Company, has been treasurer of the Hart & Cooley Company since its establishment in 1900. He will continue his present duties with that company, but will act in an advisory capacity with the new corporation. Mr. Hart and Mr. Hutchinson will be the active managers of the company which bears their name, assisted by Logan E. Page, who has had charge of the New England sales, and F. N. Steiner, the New York sales manager of the Hart & Cooley Company, and Warren Williams, engineer. Mr. Hart is a son of William H. Hart of the Stanley Works, and has had a broad manufacturing experience in New Britain. Mr. Hutchinson was recently with the Corbin Motor Vehicle Corporation.

The Dwight Slate Machine Company, Hartford, Conn., has closed down its plant pending either the sale or the reorganizing of the business. The house dates back 35 years, having been a pioneer in the manufacture of the sensitive drilling machine. The line has been modernized in the last few years to meet the new demand that has been placed on this type of machine. An important part of the company's line consists of machines and devices for marking metals and other materials with trademarks, patent dates, etc., which has been manufactured for 20 years. It also builds automatic gear cutting machines of the lighter type. The company has employed about 75 men, the equipment being ample for doing $150,000 worth of business annually.

The National Marine Lamp Company, a New York corporation, consolidating three existing concerns, has acquired the factory of the Bristol Brass Company, Bristol, Conn., at Forestville, known as the Burner shop, and will occupy it for manufacturing, concentrating the business there.

The Davis Hardware Mfg. Company, Gloucester, Mass., has been incorporated in Massachusetts with a capital stock of $35,000, and has taken over the business of the Davis Mfg. Company of that town, manufacturer of the Clarke expansive bit. Benjamin A. Smith is president of the new corporation; Frederick H. Tarr, treasurer and clerk, and Henry O. Davis, superintendent. In addition to the expansive bit, the company proposes for the near future the manufacture of a general line of drop forgings and tools, concerning which no announcement is ready.

The E. J. Manville Machine Company, Waterbury, Conn., states that it has ordered practically all of the equipment for its new machine shop building, with the exception of the large traveling crane, which will not be decided upon until later, as the building will not be ready for occupancy until next spring. The structure will be 40 x 200 ft.

The E. Ingraham Company, Bristol, Conn., manufacturer of clocks, will erect a one-story addition, 50 x 50 ft., of brick, mill construction, with saw-tooth roof.

The new buildings of the Gray Telephone Pay Station Company, Hartford, Conn., will be of reinforced concrete. The main factory will be 52 x 210 ft., four stories and basement, and the power plant 30 x 40 ft.

The C. F. Church Mfg. Company, Holyoke, Mass., manufacturer of plumbing fixtures, will erect a factory at Willimansett, 40 x 200 ft., one story, with ell 20 x 26 ft.

The New Departure Mfg. Company, Bristol, Conn., is building a mill which will be devoted to wire drawing in connection with the ball bearing department.

Additions and changes in the manufacturing industries of New England include the following: Carr Fastener Company, Boston, Mass., four-story brick and concrete factory on Ames street, Cambridge, to contain 40,000 sq. ft. of floor space; Summit Thread Company, East Hampton, Conn., two-story mill; Potter Knitting Company, Springfield, Mass., five-story brick mill, 60 x 180 ft. The United States Clothes Pin Company, Montpelier, Vt., has purchased the business of C. C. Putnam & Son, Putnamsville, Vt., and will remove the equipment to Montpelier.

The new shop of Gavin & Moriarty, at Willimansett, Mass., for the manufacture of plumbing supplies, will be 27 x 90 ft., one story.

The Brady Electric & Mfg. Company, New Britain, Conn., has been organized under Connecticut laws and will manufacture electrical specialties and roller chafe irons for wagons. Mrs. Nellie J. Brady is the president and treasurer, Frederick M. Bray secretary, and William J. Noble superintendent and manager.

A factory building three stories of brick and steel will be erected at Bridgeport, Conn., from plans by Warren & Prindle, 4 East Forty-second street, New York, who state that they are not yet at liberty to reveal the name of their client.

Philadelphia

PHILADELPHIA, PA., October 1, 1912.

The builders of tools and equipment in this vicinity have been receiving a better run of orders and more inquiry, the greater share of which comes from buyers outside of the district. Plant operations are on a better basis, and while few, except small concerns, are running at full capacity, indications point to more active engagement in the near future. Inquiries coming to merchants are still largely confined to single and small groups of tools for extension and replacement. Railroad companies in this district are understood to have lists prepared as to what shop managers would like to have, but there appears to be no immediate prospect of purchases being authorized. Recent buying by railroads has been confined to small scattered purchases of odd tools, in many cases of a special character. The demand for machine tools has been of a rather general nature. Several inquiries for electric traveling cranes are noted but develop into business slowly. An advance in price of some lines of the better grade of machine tools, such as shapers, drill presses and planers of certain makes is noted, but the movement has not been general. A fair movement in second-hand machinery is reported. Makers of foundry equipment report a much better demand, indicative of the general betterment in foundry operations.

The Armstrong Cork Company, Camden, N. J., has received bids for the erection of a brick and concrete warehouse factory and office building, 163 x 230 ft., four and five stories, from private plans. Electric light, steam heat and elevators are to be installed. Considerable machinery of a special nature will be required for the manufacturing department, as well as several general machine tools.

Under a $7,000,000 permanent loan for the city of Philadelphia, to be voted upon at the fall election, an item of $50,000 for a new machine shop for the Bureau of Fire is to be appropriated. An item of $200,000 is to be applied to new bridges and $1,600,000 for dredging, dock and harbor improvements.

The Krupp Foundry Company, Lansdale, Pa., is making a considerable addition to its foundry, which will be used as additional space for molding purposes.

The J. W. Paxson Company, manufacturer of foundry supplies, notes quite an improved demand for various foundry equipment in the past month. Orders have been more numerous as well as being larger individually and the outlook for still better condition is considered very favorable.

William Steele & Co., engineers and contractors, have begun operations on the erection of a one-story sawmill, 130 x 154 ft., on Westmoreland street below Casper street, for the Ontario Land Company.

The Glen Mills Paper Company, Glen Mills, Pa., has been receiving bids for a one-story addition to its power house from private plans.

The city of Margate, N. J., will erect a brick and steel pumping station, 40 x 54 ft., one story, from plans by W. S. Hewitt, Bartlett Building, Atlantic City, N. J. Bids have been received by the architect.

Harris & Richards, architects, are making plans for a laundry building, to cost about $10,000, for the Germantown Hospital, Penn and Chew streets, Germantown.

The Tindel-Morris Company, Eddystone, Pa., reports a better volume of business both in its forging line, as well as for its Tindel high duty saws and special Tindel-Albrecht crank shaft lathes. Inquiry is steadily improving in the machine tool lines, and plant operations are on a better basis.

The Midvale Steel Company, Nicetown, is taking estimates for the construction of an addition to its carpenter and pattern shop. The extension will be 46 x 130 ft. Details as to equipment are not available.

The incorporation of the Mauch Chunk Iron Works, Mauch Chunk, Pa., with a capital stock of $10,000, to manufacture mine and other machinery, is noted. Arthur E. James, Lansford, Pa., is named as treasurer, while Evan T. James, Phillipsburg, N. J., and Arthur E. James, P. L. Fackenthal, Edwin James and William G. Thomas, all of Lansford, Pa., are named as directors.

Baltimore

BALTIMORE, MD., October 1, 1912.

While there has been some improvement in the demand for machinery and tools, this district has not yet experienced the full force of the generally better conditions in the iron, steel and metal trades. Some builders of special metal working machine tools have taken on a better volume of business, but are still operating below capacity. A slight increase in the demand for special machinery for export is noted. The bulk of the business has been for single tools; several small groups of tools have been sold, while one fair sized inquiry has come out. There is still a noticeable absence of any important demand for machine tools from the railroads in this district. Considerable inquiry for power equipment is noted, particularly that of the medium capacity. Boilers have been in fair demand. The second-hand machinery, tool, boiler and engine trade has not been very active, but a moderate amount of this class of equipment has been moved. The demand for fabricated structural material has not been very active, the greater part of the business taken has been confined to small propositions. Few fabrication shops are being operated at capacity, although an encouraging view of the situation is taken, in that considerable business is expected to develop in the south. Dealers in machinists' and mill supplies report a fair volume of new business; that for contractors' tools and equipment is, with the approach of the closed season for outdoor work, gradually becoming less active. The foundry trade has been a trifle more active and conditions favor more active plant operations.

Bartlett Hayward & Co. have practically completed the erection of the new machine shop building previously reported and will begin the installation of machinery and tools at an early date.

The International Bedding Company, 337 North avenue, has under consideration the erection of a four story manufacturing building, with power plant, to be built on Guilford avenue between Eager and Chase streets.

The Mallory Machine Company contemplates the erection of a large manufacturing building at Light and Lee streets, to supplant its present machine shop and other buildings.

Plans are being prepared for the erection of a factory building, 62 x 131 ft., two stories, at 308 to 310 St. Paul street, for the Herr-Schofield Company, silversmiths, now located at 6-8 West Lombard street. Tentative plans call for a steam power plant. George R. Callis is the architect.

John D. Adt is preparing to occupy as an erecting shop, a portion of the property adjoining the present machine shop. A very satisfactory export demand for special tobacco working machinery is noted, orders having been received from Porto Rico and Algeria. A shipment of four carloads of special machinery has been practically completed for a tobacco concern in Tennessee. All departments of the plant continue fully engaged.

The Aumen Machinery Company has closed for the general wood and metal working machinery, pumps, etc., for the new plant of the Maryland Fire Brick Company, Harwood, Md. An automatic refrigerating plant will be furnished the Columbia Hotel Supply Company, Washington, D. C. A fair business in pumps and special machinery is noted.

Plans are being prepared for the erection of a large garage and repair station at 512 to 526 Calvin street, 80 x 112 ft., which, it is stated, will be occupied by the American Express Company. Details are not yet available.

The Baltimore Tube Company has its new plant at Bayard street and the B. & O. Railroad, practically completed and a good share of the equipment has been installed. Delay in completing the tube mill has been occasioned by an increase in size approximately 50 per cent. beyond the original plans. This will occasion considerable additional purchases of mill machinery of various classes, and may compel the erection of a new building for use in a brass foundry department. C. S. Morse is general superintendent of the plant and will purchase the additional equipment.

The Alexander Milburn Company expects to occupy November 1 a portion of its recently acquired factory, 1420 to 1428 W. Baltimore street, and is in the market for considerable machinery equipment, among which are the following: A 14 in. x 6 ft., a 12 in. x 5 ft. and a 12 in. x 4 ft. lathe, punch presses, air compressor, small air hammers, motors, 3 phase, 220 volt A. C. 60 cycle; special double seaming machinery suitable for working 20 gauge iron, water emery grinders, small tools and the necessary accessories for the equipment mentioned. W. J. McCauley has charge of the purchases. The Milburn Company has recently sold two large welding outfits for export to Mexico and has received orders for four installations in the Pittsburgh, Pa., district.

The Ellicott Machine Company reports an increased demand for heavy dredging equipment. Orders, which have been comparatively light for several months, have been more numerous. All departments of the plant continue fairly busy.

It is reported that the Chesapeake Mfg. Company has acquired a two story factory building, at Sharp and West streets, with 25,000 sq. ft. of floor space, which will be utilized for the manufacture of furniture.

Chicago

CHICAGO, ILL., October 1, 1912.

The activity of the several railroads buying in this market continues the feature of the machinery trade. Lists previously issued were augmented the past week by an additional inquiry from the Chicago, Milwaukee & St. Paul for prompt closing; a new list from the Chicago, Rock Island & Pacific for about a dozen machines and the announcement of a large list to be sent out by the Illinois Central. This latter road is now making the awards on a small list on which prices were received early in the week. The earlier inquiries of the St. Paul, made about September 1, cover equipment for new shops on the Puget Sound extension not yet completed, so that the purchase of the most recent list, which provides for additional requirements at Milwaukee and Dubuque will doubtless precede the others. Industrial buying of machinery brought out a number of good orders although business was somewhat scattered. Several sales in the Milwaukee district are noted and at East Chicago the Locomotive Superheater Company is buying equipment for its new plant. At Aurora there is in prospect an aggregate of new business of considerable proportions in connection with new construction under way at the plants of the Aurora Automatic Machinery Company, the American Well Works and the Western Wheeled Scraper Company. Developments have not matured, however, as rapidly as was anticipated. In addition to the machinery purchased a week ago, the Chicago Board of Education is about to buy a number of woodworking tools. The city of Chi-

cago is also in the market for a small quantity of machinery. The International Harvester Company has been buying machinery for its German plant and also a small quantity for local extensions.

The last Chicago, Milwaukee & St. Paul Railway list is as follows:

Two 34-in. upright drills.
One 1600-lb. steam hammer.
Three 1½-in. double bolt cutters.
Two 36 x 36-in. x 10 ft. planers.
Two 24-in. x 12-ft. traveling head shaper.
Three 5-in. vertical boring mills.
Four wet emery grinders.
Three 16-in. bolt lathes.
One 36-in. throat, double punch and shear.
One 48 x 48-in. x 16-ft. planer
Two 42-in. drills.
One 36-in. x 18-ft. lathe.
One 36-in. boring mill.
One 16 x 6-ft. engine lathe.
One 28 x 18-ft. lathe.
One rotary bevel shear, capacity ¾ in.
One 1600-lb. steam hammer.
One 42-in. throat double punch and shear.
One 18-in. x 7-ft. lathe.
One 100-lb. helve hammer.
One 300-ton hydraulic wheel press.
One 2-in. heading and forging machine.
One 4-spindle multiple drill.
One 3-in. pipe machine.
One 42-in. car wheel lathe.
One No. 2 universal miller.
One 2 x 24-in. flat turret lathe.

The Carpenter Sprinkler Company, Chicago, has been incorporated with a capital stock of $30,000 by A. A. Carpenter, John W. Ellis and Harry A. Lewis to do a general manufacturing and building construction business.

The Langer Auto Castings & Foundry Company, Chicago, has filed notice of a change in its name to the Diversey Foundry Company.

The International Harvester Company, Chicago, is building additions costing $20,000 at its Deering works.

The Acme Steel Goods Company, Chicago, has increased its capital stock from $400,000 to $500,000.

The American Car & Foundry Company has had plans prepared for the erection of a machine shop 70 x 144 ft., one story, to cost $16,000, at Madison, Ill.

The Sterling Foundry Company, Sterling, Ill., will erect a large addition to its foundry in the near future.

The Charles City Engine Company, Charles City, Iowa, has been incorporated with a capital stock of $150,000 and will build a factory in that city for the manufacture of oil, gas and gasoline engines. The directors are J. E. Armstrong, C. L. Armstrong and Geo. C. Armstrong.

The Blake Specialty Company, Davenport, Iowa, has plans for additions to its plant to include a machine shop 60 x 75 ft., a foundry 80 x 100 ft. and a coreroom 20 x 30 ft.

The Ajax Foundry Company, Milwaukee, Wis., has been organized with a capital stock of $10,000 by Peter Petry, C. Stein and William Toepel.

The Wisconsin Foundry & Machine Company, Madison, Wis., has taken out a permit for the erection of a new machine shop to cost $4,000.

The R. C. Wells Mfg. Company, Fond du Lac, Wis., has been incorporated with a capital stock of $200,000 for the purpose of building a plant for the manufacture of automobile accessories.

The North American Mine Company, Tower, Minn., has plans for the erection of mine machine shop in the near future. Equipment will be needed.

The Chicago, Milwaukee & St. Paul Railroad plans to erect at Mannheim, Ill., a new 30-stall roundhouse and will construct a new switching yard with 45 miles of track.

Bahaaf Bros., Chicago, have taken out a permit covering the erection of a five-story brick factory building at 1024 South Central Park avenue, to cost $120,000.

The Link-Belt Company, Chicago, will build an addition to its foundry, 100 x 450 ft., on West Thirty-ninth street. Considerable new foundry equipment will be installed.

Bradley & Vrooman, Chicago, have let the contract for a factory building, three stories and basement, 94 x 100 ft., to cost $45,000. The architects are Furst & Weber, 10 South LaSalle street.

The Peoria Signal Mail Box Company, Peoria, Ill., organized with a capital stock of $25,000, will engage in the manufacture of signal mail boxes. George H. Meyers, Ralph Jester and Elva C. Gingrich are the incorporators.

The city of Shawano, Wis., will receive bids for furnishing and installing of one complete 50 kw. generator and 80 h.p. engine, as per plans and specifications on file with C. F. Lueke, chairman of the Improvement Bulletin, Minneapolis, Minn.

Detroit

DETROIT, MICH., October 1, 1912.

Machinery houses in Detroit report that the total volume of business for September shows an increase over August, although the past week has been comparatively dull. Inquiries are fairly plentiful, but business seems to close rather slowly. This condition, however, is reported to apply mainly to local business, that from up-state resulting in speedier purchases. Buying by the auto accessories makers continues in some volume. A good demand exists for electrical equipment and a number of sales of large dynamos have been closed recently. The market for second hand machinery is narrow and the stocks of some dealers are piling up. The demand for both boilers and engines is comparatively good. Little that is new in building operations is before the trade, although contractors are well engaged on work heretofore awarded.

The Detroit Motor Chassis Company, Detroit, has been incorporated with $25,000 capital stock to build automobile chassis. The company has established a plant at 960 Champlain street, and will be turning out complete chassis by November 1. The officers are A. J. Kinucan, president; J. L. Stringer, secretary, and William P. Culver, treasurer.

The Bryant & Berry Company, Detroit, operating a brass foundry and pattern factory, has merged its business into a stock company under the style of the E. S. Bryant Pattern Company, with $2,000 capital stock.

The K-R-I-T Motor Car Company, Detroit, has under way the construction of a new manufacturing building, and will soon start the erection of a second addition. The new buildings will greatly increase the capacity of the plant.

The Parrish Mfg. Company, Detroit, manufacturer of automobile frames, has awarded a contract for the erection of a brick addition to its plant on Milwaukee avenue.

The Long Mfg. Company, Detroit, manufacturer of automobile radiators, will add another building to its plant. The details of construction and equipment have not been fully determined as yet.

The Merralls Starter Company, Detroit, has been incorporated with a capital stock of $150,000 to manufacture gasoline engine starters and other automobile accessories. The incorporators include William A. Merralls, Robert S. Neely and Harlow B. Lowland.

The Edison Illuminating Company, Detroit, has begun the erection of a large electric lighting plant at Sandwich, across the river from this city. The new plant will furnish light for several surrounding towns.

The W. H. Hill Company, Detroit, drug manufacturer, has awarded a contract for the erection of a new factory at 58 Selden avenue, to be 40 x 105 ft., and two stories.

The Michigan Cash Register Company, Detroit, is having plans prepared by Albert Kahn, architect, for the erection of a new plant at Fifth and Porter streets. A four-story factory of reinforced concrete construction, about 138 x 150 ft., will be erected. The company expects to have its new quarters ready for occupancy by January 1.

The Detroit Standard Gear Company, Detroit, has been incorporated with $50,000, capital stock to manufacture transmission gears and do a general machine shop business. The new company has established a plant at 745 Woodbridge street. The incorporators are D. M. Ireland, M. E. Smith and L. E. Straw.

The Hupp Motor Car Company, Detroit, automobile maker, has increased its capital stock from $500,000 to $750,000 to provide for plant extensions.

The Ross & Young Machine Company, Detroit, has acquired a site 100 x 200 ft. at McDougall and Jefferson avenues, and will, it is stated, erect a new factory. The company manufactures automobile engines.

The Sattley Coin Handling Machine Company, Detroit, has filed articles of incorporation giving its capital stock at $100,000. The new company proposes to manufacture a device for sorting and packaging coins. Homer Warren, Lawrence D. Buhl and Thomas Hunter are named as incorporators.

The Moyer-Shaw Mfg. Company, Detroit, makers

of automobile parts and metal stampings, has increased its capital stock from $50,000 to $500,000.

The Belleview Furnace Company, Detroit, manufacturers of oil and gas furnaces, has increased its capital stock from $25,000 to $35,000.

The Leggett & Platt Spring Bed Company, Carthage, Mo., has purchased a two-acre site in Windsor, across the river from Detroit, and will at once begin the erection of two factory buildings, each 50 x 150 ft.

The Memphis Elevator Company, incorporated with $10,000 capital stock, will erect a grain elevator at Memphis, Mich. J. A. Heath is secretary.

The Michigan Turpentine Company, Bay City, Mich., will be reorganized, and it is planned to utilize the Bay City plant for refining purposes and to establish three additional distillation plants.

It is reported from Ovid, Mich., that the Fox & Mason Furniture Company, Corunna, Mich., will establish a branch plant at Ovid.

Bauske Bros., Muskegon, Mich., carriage manufacturers, have awarded a contract for the erection of a two-story brick factory building.

The Shaw-Walker Company, Muskegon, Mich., manufacturer of office devices, has increased its capital stock and will erect an addition to its plant to cost approximately $50,000. The new building will be utilized for the manufacture of steel filing cabinets.

The Wyandotte plant of the Detroit Shipbuilding Company, Detroit, Mich., was almost entirely destroyed by fire September 28. The loss is estimated at over $200,000.

The Conway-McLeod Foundry Company, Detroit, has been organized with $15,000 capital stock to take over the foundry plant of Thomas H. Conway and Malcolm J. McLeod, at 675 East Atwater street.

The taxpayers of Port Austin, Mich., at a special election voted to bond for $8,000 for the construction of a waterworks system.

The Twin City Packing & Sausage Company, Menominee, Mich., is remodeling its plant and installing additional equipment.

M. Brandy & Sons, Grand Rapids, Mich., metal and machinery merchants, will erect a warehouse 80 x 100 ft., to be used for the storage of machinery.

Frederick Fisch, Rogers City, Mich., will erect a brewery at that place. The equipment has not yet been provided for.

The city of Ironwood, Mich., is planning the installation of a filtration plant in connection with the municipal waterworks.

The Imperial Wheel Company, Flint, Mich., has been reorganized with a capital stock of $200,000. The company has acquired a factory building and is now installing machinery.

Cleveland

CLEVELAND, OHIO, October 1, 1912.

There is a very good demand for single machine tools of all the standard kinds. Manufacturing plants in metal working lines are generally busy and are adding to their equipment as needed. One satisfactory phase of the present situation is that there is usually little delay in placing an order after the inquiry comes out. No new inquiries for round lots of tools have come out. September as a whole was a very good month and most dealers did a larger volume of business than in the preceding month. The outlook for October is very promising. The demand for general machinery and handling equipment is good. During the past two or three weeks a heavy demand has developed for forgings, both for railroad and other classes of work. In foundry lines there is a good demand for gray iron, malleable iron and brass castings. The labor situation is somewhat unsatisfactory, there being a scarcity of common labor, machinists and machine operators.

The Rummel Machine Screw Company, Cleveland, has increased its capital stock from $30,000 to $50,000. The increase was made to provide funds for the installation of additional machinery equipment, orders for which have been placed.

The Chamberlain Cartridge & Target Company, Findlay, Ohio, will build an addition to its plant.

The Glauber Brass Mfg. Company, Cleveland, Ohio, maker of plumbers' brass goods, will enlarge its plant by the erection of a two-story brick addition about 20 x 100 ft.

The new plant of the Toledo Factories Company, Toledo, Ohio, is about completed and will be ready for occupancy early in October. This plant, which is located at Woodruff avenue and North Twelfth street, was erected to supply manufacturing space and power for small industrial concerns. About 160,000 sq. ft. of floor space is provided.

The new plant of the Buckeye Twist Drill Company, Alliance, Ohio, has just been placed in operation. This company succeeded the Michigan Twist Drill Company, formerly located in Detroit. The factory building is a brick structure 60 x 175 ft. Its products will be twist drills, reamers and cutters. The company is incorporated with a capital stock of $150,000. E. D. Rogers of Cleveland is president and A. Mulec is general superintendent.

William E. Berrington, selling agent for pump machinery, gas and gasoline engines, condensers, air compressors and water meters, has moved his offices from 802 New England Building, Cleveland, Ohio, to more commodious quarters at 306 Rockefeller Building in that city.

The Silberzahn Gas Engine Company, Toledo, Ohio, has been incorporated with a capital stock of $10,000 by Fred H. Kruse and others. The company will take over a factory that has been conducted by the Silberzahn Brothers on Clark street.

The Potter Metal Specialty Company, Cleveland, has been incorporated with a capital stock of $10,000 by James G. Raquette, John Langford, Frank V. Case and others.

The Etna Machine Company, Toledo, Ohio, will enlarge its plant by the erection of a new factory building 60 x 100 ft.

The Rauch & Lang Carriage Company, Cleveland, builder of electric automobiles, will erect a large addition to its plant. Plans are being prepared by George S. Rider & Co., engineers.

The Cleveland Co-operative Stove Company, Cleveland, will enlarge its plant by the erection of a one-story brick addition about 65 x 80 ft.

The Safety Gas Valve Company, Cleveland, has been incorporated with a capital stock of $10,000 by Phelps Crum, J. A. Chamberlain and others.

With a capital stock of $25,000 the Sash Hanger Mfg. Company, Wellsville, Ohio, has been incorporated by D. E. Galer, J. W. Patterson, M. F. Kemena and H. F. Apple.

The Kirk Supply Company, 1739 Liberty avenue, Pittsburgh, Pa., is in the market for a 10-ton electric traveling crane, with 50-ft. span, to be operated at 220 single phase, 60-cycle alternating current.

Cincinnati

CINCINNATI, OHIO, October 1, 1912.

Reports from a number of local machine tool builders indicate that domestic business slackened up somewhat in the last week of September. However, the export trade continues to hold its own, and practically every shop in this territory is running full time, and quite a number are operating night shifts. The scarcity of skilled labor is handicapping a few plants to some extent, and there are no indications that this trouble will be remedied at any early date.

Second-hand machinery dealers report a continued slight improvement. Local foundries, as a rule, are very busy. Electrical equipment is in good demand, and makers of metal working machinery, such as punches, shears, etc., are enjoying a better business than for some time past, and as the orders coming in are well scattered, it would indicate that conditions in all parts of the country are on the mend.

The International Steam Pump Company, 115 Broadway, New York, is inquiring in this market for one 26-in. engine lathe, double back geared and one 48-in. geared head engine lathe, to be of sufficient length to take 12 ft. between centers; to be driven by a 20 h.p. motor, 220 direct current voltage, with speed ratio 6 to 1.

The Tool Steel Gear & Pinion Company, Cincinnati, has plans under way for an addition to its plant in Carthage suburb.

The Federal Motor Supply Company, Cincinnati, recently incorporated with $250,000 capital stock, is seeking a site for a salesroom, warehouse and light manufacturing purposes. A. M. Draddy and Emil Schmidt are named among the incorporators.

The Ahrens Iron Company, Cincinnati, has secured contract for a large steel and brick manufacturing addition to the plant of the Charles Boldt Glass Company, on David lane.

The Portsmouth Steel Company, Portsmouth, Ohio, is asking for bids on heating and ventilating equipment to be installed in a large one story building now being fitted up for warehouse purposes.

Late orders for metal working machinery, received by the J. M. Robinson Mfg. Company, Cincinnati, include the following: Twelve punch presses for the Corcoran Brothers Lamp Company, Cincinnati, and the

Schiedle Toy & Novelty Company, Dayton, Ohio; one 10-ft. press pattern machine and one railway pattern machine for the Impervious Sheet Steel Company, Pittsburgh, and a miscellaneous lot of single machines to be shipped to different parts of the country.

The Hisey-Wolf Machine Company, Cincinnati, recently received notice that it was the successful bidder on the electric drills and grinders to be installed on the Government yacht, Mayflower.

Engines, boilers and electric generators will be required for installation in the proposed Crane-Hawley building, on Main street. Architects Elzner & Anderson, Cincinnati, will receive bids on this equipment until October 8.

The Phoenix Mfg. Company, Eau Claire, Wis., has had a representative in Cincinnati the past week, making purchases of machine tools and other equipment. It is not known if all the company's machinery requirements have been supplied.

It is quite probable that two power buildings, for light manufacturing purposes, will be constructed in Cincinnati, during the next 12 months. Elzner & Anderson, Cincinnati, are preparing plans for an eight-story power building to be erected on Sycamore street, and it is rumored that the Lunkenheimer Company will construct one of similar hight on a site on Eighth avenue, now occupied by its city offices.

Some large additions to the plant of the Portsmouth Waterworks Company, Portsmouth, Ohio, are being planned. Curtis & Shumway, Portsmouth, have been selected as contractors, and it is stated that the proposed improvements will represent an outlay of nearly $1,000,000.

Architects B. L. Baldwin & Co., Cincinnati, are preparing plans for a three-story brick and steel addition to the plant of the Corcoran Brothers Lamp Company, on Reading road. The proposed building will be about 35 x 140 ft., and considerable miscellaneous equipment will be required.

The Ideal Steel Wheel Company, 1919 Race street, Cincinnati, whose plans were recently mentioned, is seeking a manufacturing building for turning out a patented automobile wheel.

The Standard Electric Tool Company, Cincinnati, has increased its capital stock from $10,000 to $15,000, and, it is understood, will add to its manufacturing facilities. The company was recently organized with F. P. Hamilton as president and F. S. Baldwin, secretary and treasurer.

Otis Howard, 2096 Ross avenue, Norwood, Ohio, is in the market for a 6 to 12 h.p. steam engine.

The Moores-Coney Company, Cincinnati, is in the market for a gravel and sand conveying outfit to be installed on the river front within the city limits.

The John B. Morris Machine Tool Company, Cincinnati, has acquired an adjoining site which will be used as a storage yard. The company does not intend making any additions to its plant, as has been currently reported.

The proposed addition to the plant of the Ralston Steel Car Company, Columbus, Ohio, will be 125 x 400 ft., one story and of brick and steel construction.

The Clifton Springs Distilling Company, Cincinnati, will erect a large cooling tower, and in the equipment needed is one 2000 gal. iron tank.

Indianapolis

INDIANAPOLIS, IND., October 1, 1912.

The Sanders Mfg. Company, Indianapolis, has been incorporated with $5,000 capital stock to manufacture office furniture and fixtures. The directors are F. Sanders, E. W. Zaiser and P. E. Brown.

The board of trustees of the Indiana State Prison at Michigan City, Ind., will enlarge the binding twine factory by the erection of an additional building to cost $25,000.

The M. Rumely Company, Laporte, Ind., will build a plant for the production of orchard tractors.

The Citizens' Mutual Light, Heat & Power Company, Valparaiso, Ind., has been incorporated with $100,000 capital stock. The directors are Charles E. Foster, John W. Sieb and James H. McGill.

The Ajax Construction & Engineering Company, Gary, Ind., has been incorporated with $50,000 capital stock to do a railroad and general construction business. The directors are G. H. Manlove, H. V. Otto and A. D. Smith.

The plant of the Faultless Castor Company will be moved from Omaha, Neb., to Evansville, Ind.

The South Bend Furniture Mfg. Company has purchased for $13,000 a site for a new addition to its plant which will nearly double its capacity.

The Auto Player Action Mfg. Company, Connersville, Ind., has been incorporated with $25,000 capital stock to manufacture piano players. The directors are Albert Krell, William W. McFarlan and Edwin B. Pfau.

The Miller & Nickel Company, New Albany, Ind., has been incorporated to manufacture vehicles. The directors are: W. F. Miller, C. Miller and Joseph L. Nickel.

The City Council of Sullivan, Ind., has granted a franchise for a waterworks system to E. M. Kerlin of Vincennes, Ind., extending 25 years.

The Steel Scaffolding Company, Evansville, Ind., has been incorporated with $50,000 capital stock to manufacture steel scaffolding. The directors are J. R. Goodwin, W. C. and P. E. Goodwin.

The Rutenberg Electric Company, Logansport, Ind., has been incorporated with $50,000 capital stock to manufacture electrical devices. The directors are E. A. Rutenberg, J. F. Digan and J. E. De Long.

The Capitol Welding Company, Indianapolis, has been incorporated with $15,000 capital stock to operate a repair and welding plant. The directors are M. Sullivan, G. W. Bivens and T. R. McCormick.

The Mulloy Scale Company, New Albany, Ind., has been incorporated to manufacture scales. The directors are B. P. Nudlin, Ed. Doherty and J. V. Halpin.

The Central Foundry Company, Fort Wayne, Ind., has plans for the erection of a new foundry in the near future.

The Chambers Mfg. Company, Shelbyville, Ind., has been incorporated with a capital stock of $50,000 to manufacture and sell heat insulated cooking devices. The directors are J. E. Chambers, Albert Deprez, Samuel Kennedy and D. H. Whitcomb.

The South

LOUISVILLE, KY., October 1, 1912.

A noticeable improvement in business conditions has developed. More inquiries are coming out, and a lot of business which has been tied up for one reason or another is being released. Machinery men in the Ohio Valley and the Central South feel that they have a good foundation to work on, for crops in this territory are going to be unusually large. Midsummer business was held back by the practical failure of the wheat crop, but with a bumper corn crop in prospect, not to mention tobacco, hogs, etc., it is certain that there will be plenty of money brought into this section. About the only lines which are dull are specialties affected by the season. Power equipment, wood-working machinery, etc., are all moving as well as could be expected.

The Pulaski Grain & Milling Company, Pulaski, Tenn., will install a cotton gin. It is also contemplating the addition of equipment to its milling plant.

The Virginia-Carolina Naval Stores Company will build a large still for the production of turpentine and other forest products at Columbia, Miss.

The J. J. White Lumber Company, McComb City, Miss., is to install a large band-mill at Columbia. Power machinery will be required in addition to sawmill equipment.

The planing-mill of J. S. Minor, Louisville, was damaged by fire September 27. Some of the woodworking machinery will have to be replaced.

The Kentucky Overhead Irrigation Company, Louisville, has been incorporated with $150,000 capital stock by Carl Hanser, F. H. Hibberd, George F. Emrich and others to make machinery for irrigation plants. Mr. Emrich's address is the Willard Hotel. Plans for manufacturing have not yet been formed.

The Louisville Railway Company has completed plans for the construction of repair shops at Twenty-ninth street and Broadway, and a contract for the building will be let at once. A considerable amount of equipment will be required for this plant. Helm Minary may be addressed for details.

The East Tennessee Cotton Oil Company has begun the erection of a cotton gin at Hickman, Ky. Power equipment and other machinery will be needed for the plant.

The coal tipple and power plant of the McHenry Coal Company, McHenry, Ky., were destroyed by fire September 20. The loss was in the neighborhood of $25,000. Rebuilding work will be rushed.

Madisonville, Ky., will install a drilling equipment and pumps and attempt to develop artesian wells for the operation of a water system. J. F. Dempsey is chairman of the Board of Public Works.

William Redman and Luther Neighbors, Glasgow, Ky., are purchasing machinery for the equipment of a

planing-mill. It will be put in operation within 60 days.

C. L. Croan and W. N. Griffin, Shepherdsville, Ky., have purchased 3700 acres of timberland in that section and will install sawmills in the immediate future.

The City Council, of Bowling Green, Ky., has authorized the purchase of an additional boiler for the municipal electric light plant. Address the city engineer.

The Cloverport Ice Company, Cloverport, Ky., has decided upon the installation of an electric light plant and will purchase equipment shortly. A. A. Simmons is president of the company.

The John Obrecht Sons Mfg. Company, Tell City, Ind., has been organized and will erect a plant for the manufacture of lawn-swings.

The Tennessee Chair Company, Greeneville, Tenn., has been organized and has leased a building. Machinery is now being bought. Joseph Moore is general manager of the company.

St. Louis

ST. LOUIS, Mo., September 30, 1912.

In the machine tool market the month just closing has not quite come up to the preceding similar period in aggregate business, but dealers are well satisfied with the total and with the prospects for the future as well. The business moving is general, being confined to no one section, nor to any one class of tools, while the inquiries are reasonably numerous. Second-hand tools are in fair request. Collections are reported good.

The Polar Wave Ice & Fuel Company, St. Louis, has purchased a site for an additional plant for artificial ice manufacture. It will also equip a warehouse with 10,000 tons storage capacity.

The mill of the Ralston Purina Company, in East St. Louis, was burned last week with a loss of $150,000, of which $85,000 was on machinery of a highly specialized character. The plant and mechanical equipment will be replaced at once.

The Frederick W. Drosten Company, St. Louis, has purchased a building which will be equipped with machinery for jewelry and silverware manufacture.

The Plantation Equipment Company, St. Louis, which has been organized with $100,000 capital stock, William C. Zelle being president, has purchased a site at Valley Park, Mo., a suburb of St. Louis, and will construct a forge shop, machine shop and assembling shop to cost with equipment about $100,000. The company will manufacture gasoline-propelled agricultural implements. Brenneke & Fay are engineers.

The Simplex Novelty Mfg. Company, St. Louis, with $10,000 capital stock, has been organized by Alfred Ramel, John R. Gilda, Conrad Reinbeck, John C. Bossert and others, and will build a plant for the general manufacturing of mechanical devices.

The Carbon Mold & Jewelry Company, St. Louis, has been incorporated with $50,000 capital stock by Lester I. Heyman, Adolph Herman, W. H. Voss, Ernest Essmueller and others to manufacture machinery and jewelry molding apparatus.

The Eureka Table Company, St. Louis, incorporated with $50,000 capital stock, will build a plant for the manufacture of tables, furniture, etc. The incorporators are Theodore Wolf, M. J. E. Hartman and others.

The Central Planing Mill & Building Company, Kansas City, Mo., with $75,000 capital stock, has been organized by S. E. Graham, A. Freeman, C. E. Lewis, W. M. Wall, E. S. Crouse and others to equip a large planing mill and also do construction work.

The Imperial Mining Company, with $25,000 capital stock, has been organized at Joplin, Mo., by S. H. Velie, Frank E. Weeks, Thomas A. Velie and Thomas Walker to equip and operate mining property owned by them.

The Gerard B. Lambert Company, recently reported as having acquired land in Arkansas, will with Elaine as headquarters equip its property, about 20,000 acres, with mills capable of working up 200,000 ft. per day. Locomotives, logging machinery, about 8½ miles of railroad, etc., are included in the company's plans. Gerard B. Lambert of New York, Henry F. Holbrook of Elaine, Arthur H. Lowe of Fitchburg, Mass., and E. M. Kelley of Helena, Ark., are the incorporators.

A sawmill and veneering plant is to be built by the Singer Mfg. Company, Cairo, Ill., on timber land purchased by the company near Tallulah, La.

Equipment for the raising of about 2000 tons of coal per day is to be installed on coal lands near Walling, Tenn., by the Van Buren County Tennessee Coal Company, with $1,000,000 capital stock, of which J. H. Sowder, of Austin, Tenn., is chief engineer.

The United Fuel Company, Fayetteville, Ark., has completed plans for the development of about 5000 acres of coal lands near that city. About $150,000 is to be put into machinery, etc.

The Dustin Standard Cotton Compress Company, Dustin, Okla., with $20,000 capital stock, has been organized, and will put in a compress at once. The incorporators are Alva E. Smith, J. H. Swafford, L. T. Sheets and others.

A ginning plant with equipment costing about $5,000 is to be constructed at Quinton, Okla., by W. S. Braden to replace the plant recently destroyed by fire.

The city of Palmyra, Mo., has voted a bond issue of $6,000 for the extension of its electric-light and water-works-plant equipment.

About $12,000 is to be expended at once by the city of Higginsville, Mo., for the improvement of the equipment of its electric-light and water works.

The city of Rich Hill, Mo., has formally voted $15,000 for the extension of its electric-light and power plant.

A flour mill, with necessary mechanical equipment, it is reported, will be built at Siloam Springs, Mo., by A. B. Current.

The Hydroze Paint Company, Kansas City, Mo., with $20,000 capital stock, has been incorporated by E. E. Blackman, M. Steele, F. W. and W. F. Samuelson to equip a plant for the grinding and manufacture of paints.

The Chat River Mining Company, Aurora, Mo., has been incorporated with $10,000 for the purpose of developing mining property owned by J. T. Cutright, George Hutchison, C. H. Kennedy, John L. McNatt and C. C. Plank.

The Emma A. Mining Company, with $100,000 capital stock, has been incorporated at Joplin, Mo., by Stanley Watson, Walter S. Watson and John Merritt to equip mining property owned by them with necessary machinery.

The Mansfield Light & Power Company, Mansfield, Mo., with $10,000 preliminary capital stock, has been organized by F. B. Fuson, M. W. Oliver and Henry Simpson to operate a public-service light and power plant.

The Missouri & North Arkansas Railroad Company has plans for the construction and equipment of shops at Eureka Springs, Ark., to cost with mechanical equipment about $150,000.

Bids will be received until October 22 by the city of Morgan City, La., for the construction of a water-works pumping station. The mayor has charge.

The city of Lambert, Miss., will drill for an artesian water flow for its municipal supply, and is in the market for the necessary machinery.

The Morton Mercantile Handle Company, Morton, Ark., will build and equip a plant for the manufacture of handles. The incorporators are E. M. Goodwin and W. M. Isom.

The Whitcomb Cabinet Company, Kansas City, Mo., will build a $50,000 plant for the manufacture of interior woodwork, etc.

The Kansas City Packing Box Company, Kansas City, Mo., has plans for the construction of a $100,000 plant.

The Hackmann Mfg. Company will build a $50,000 plant at St. Louis, Mo., for the manufacture of beer crates, etc. Frederick Hackmann and others are interested.

The Gibbs Lumber Company's mill at Hot Springs, Ark., recently burned, will be replaced. The machinery will cost about $5,000.

A plant for the manufacture of a patented motor plow is to be built on a site purchased at Muskogee, Okla., by Jarrett B. Wood, of Chattanooga, Tenn., and others organized as the J. W. Wood Plow Works.

The Lakeshore Oil Company, New Orleans, La., with $250,000 capital stock, has been organized. The incorporators are W. E. Aymar, C. L. Foreteich and others.

Equipment soon to be installed by the Bates County Natural Gas Company, Rich Hill, Mo., includes a gas compressor and pumps for each of the wells owned by the company.

A cold-storage plant is to be built at Pine Bluff, Ark., by the Bahlan Produce Company, and machinery is being sought by that concern.

The city of Ruston, La., has decided to construct an ice-manufacturing plant for public use under the direction of the mayor.

The Cross Country Rice Company, Wynne, Ark., with $50,000 capital stock, has been incorporated by

F. D. Rolfe, J. D. Hare and others for the purpose of equipping a large rice mill.

A sawmill of 25,000 ft. daily capacity is to be installed at Choudrant, La., by the J. A. Frasier Lumber Company.

A plant for the manufacture of yellow-pine lumber will be installed at Ramsay, La., by the H. M. Smith & Sons Lumber Company, Lexis, Miss. The capacity is to be about 35,000 ft. daily, and the machinery to cost about $9,000.

The App Roofing & Metal Company, Ltd., New Orleans, La., has been organized with $40,000 capital stock by P. J. Gillen, W. F. Denny and E. C. App, and will equip a plant for the manufacture of roofing material.

The Chicago-Lehigh Mining Company, Joplin, Mo., will put in a concentrating plant, with equipment to cost about $5,000.

Texas

AUSTIN, TEXAS, September 28, 1912.

Trade conditions continue unusually good. Prospects for a still larger demand for various kinds of machinery and tools this fall and winter are very promising. Beneficial effects of the money derived from the sale of the cotton crop are being felt with increasing strength in all lines of trade and industry. The worst feature of business affairs in this state at present is the car shortage. The railroads are unable to move their shipments promptly, due to the lack of sufficient equipment to meet the demands upon them. There is no prospect of any relief from this annoying state of affairs for some time to come.

John W. Gaines will construct an irrigation canal system and install a pumping plant near Bay City for the purpose of irrigating 3000 acres of land.

The construction of a municipal sewer system at Electra, to cost about $26,000, is under consideration. Bonds will be issued for the purpose.

Preliminary steps have been taken by the land-owners located east and south of Roswell, N. M., for the formation of a drainage district that will embrace an area of about 100,000 square miles. It is proposed to construct a system of drainage canals and ditches to cover all parts of this large body of land.

The Teague Development Company, Teague, is preparing to bore wells in that section in search of oil or gas.

The Port Arthur Water Company is installing new equipment in its electric light plant at Port Arthur. The company is a subsidiary of Stone & Webster, Boston, Mass.

The Bartlett Sewer Company has let the contract for the construction of a sewer system at Bartlett to the Dallas Lime & Gravel Company. The engineering work will be performed by the Ehlers Engineering Company, Cameron.

The Commissioners' Court of Orange County has granted the petition of landowners for the creation of a drainage district in the northern part of the county to embrace about 30,000 acres of land. As soon as the necessary surveys and other arrangements can be made the construction of a drainage system to embrace the land in question will be started.

E. D. Steger is erecting a large grain elevator at Bonham.

The North Texas Power Company will make extensive improvements to the waterworks plant and distributing system and the electric light plant at Wichita Falls.

The City Council will install new machinery in the electric light and waterworks plant at Hallettsville.

An election of taxpayers of Big Springs will be held to vote on the proposition of issuing $50,000 of bonds for the construction of a waterworks distributing system and the installation of a pumping plant.

The Chamber of Commerce of Victoria is promoting the establishment at that place of a canning and pickling factory and a cold storage plant.

Wintz & Daniels are installing a lumber mill at Kountze.

The Commercial Club of Bryan is promoting the establishment at that place of a large carriage factory.

The Pacific Coast

PORTLAND, ORE., September 24, 1912.

The volume of work at Oregon and Washington machine shops continues to increase, and the need of new machinery is becoming more apparent. Aside from the railroad business formerly mentioned, few single projects of special importance are noted, but orders on the average are a little larger than they have been, and buying is fairly general all over the territory.

The heavy demand for lumber has resulted in a number of new logging development projects, and contracts have already been placed for considerable railroad construction to reach more remote tracts of timber. This will doubtless bring out some demand for construction equipment, as contractors are already fairly busy on power and railway construction. Orders are coming out steadily for both logging and mill machinery, the former very largely, and the latter partly of local manufacture. The demand for marine equipment also continues active, including a large amount of hoisting machinery, etc. While the movement of mining machinery to the Nome district of Alaska is over for this year, steamers leaving Seattle for southeastern Alaska are taking heavy shipments both for that district and the Klondike. A steamer leaving September 21 carried 40 carloads of mining equipment for one concern.

Orders from flour mills and grain handling firms, both inland and along the coast, are a more important factor than for some time past.

A contract for two sets of boilers for dredges to be used in local harbor work have been let to the Hawkes Boiler Company, Chicago.

The city of Spokane, Wash., has authorized the construction of a repair shop for fire apparatus.

The Northwestern Electric Company, this city, has purchased a large Chicago pneumatic rock drill outfit for its hydro-electric development at White Salmon, Wash.

The Chehalis Foundry & Machine Company, Centralia, Wash., has been incorporated with a capital stock of $10,000 by A. S. St. John, J. L. Kuehner and Dan Bush.

Edward I. and Thomas S. Garrett have bought out the interest of T. M. Green, formerly president of the Puget Sound Machinery Depot, Seattle, Wash. Mr. Garrett is now president of the company.

The Willamette Iron & Steel Works, this city, is furnishing a special logging rig for the Smith-Powers Logging Company, Marshfield, Ore.

J. J. Currie is preparing to install a sash and door factory at Bend, Ore.

The Railway Equipment Company, this city, has sold a 62-ton Climax locomotive to the Big Creek Logging Company.

Eastern Canada

TORONTO, ONT., September 27, 1912.

There has been a state of comparative standstill in crop moving operations because of the backward weather at the season usually given to harvesting. The army of hands assembled to engage in harvesting, the great muster of cars and locomotives prepared to handle the grain, and the funds brought together by the banks to finance the crop movement have largely been marking time. The effect has been felt in a slight degree upon the general state of business.

The feature of the opening day of the fall fair at Stratford, Ont., was a demonstration of the electric labor savers for farm and household under the direction of Mr. Espenfield of the Ontario Hydro-electric Commission.

The Preston Car & Coach Company, Preston, Ont., has purchased the patent rights in Canada for the manufacture of a trolleyless electric car, made in York, Pa., by the Barber Car Company.

The Grand Trunk Railway management has placed an order for the building of 100 new locomotives of the most modern character. The contracts have been divided among firms in Kingston, Montreal and Philadelphia. The contractors have been requested to push the work so that they may all be in service in a year. Each of the locomotives will cost $20,000, which means a total expenditure of $2,000,000.

The ratepayers of St. Thomas, Ont., voted favorably on by-laws providing for the following industrial arrangements: First, a municipal loan to Gerrard Noble, formerly general manager of the Mooney biscuit factory, Stratford, of $35,000 to establish a biscuit and confectionery manufacturing company, and a fixed assessment of $5,000 for ten years, guaranteeing to start operations with 75 employees.

Second, to A. J. Strough, of Galion, Ohio, manufacturer of steel grave vaults, a free site not to exceed $3,500 in cost, undertaking to employ 35 men.

Third, to W. G. Rogers, of the Erie Iron Works, of St. Thomas, $15,000 loan to extend his plant, undertaking to increase his staff by 40 men.

Following the recent purchase of ten locomotives for the Intercolonial, the Dominion Government has arranged for the purchase of five more engines of heavy type.

Five by-laws calling upon the citizens of London, Ont., to consent to five-year loans totaling $175,000, will be submitted in the January voting in an effort to bring new industries to London that promise to employ between 1,000 and 1,200 hands.

The Buffalo Brakebeam Company, a large Buffalo concern, which has a small branch in Brantford, Ont., has decided to establish a large branch in Hamilton. It has been awarded a large contract by the National Steel Car Company. A temporary plant will be opened on the property of the Hammant Steel Car Company, Hamilton.

The Edison Illuminating Company, of Detroit, has commenced work on a large lighting plant on the river front in Sandwich, Ont., which, when completed, is expected to supply current for both heating and lighting to the towns of Essex, Leamington and Amherstburg. These towns are at present supplied by small local plants at a cost considerably higher than will be charged by a single central system.

Announcement was made in Brantford, Ont., that the Pratt & Letchworth Company had plans out for a very large extension to its plant in the Grand Trunk yards, and that a large extra force of men would be required when additions were completed.

The Quebec Graphite Company is building a plumbago factory at Buckingham, Que.

The pulp mill of the James McLaren Company, at Buckingham, Que., is to be enlarged.

The Great West Wire Fence Company is preparing to put up a factory at Fort William, Ont., to cost $100,000.

The Denis Wire & Iron Works Company proposes to double its plant at London, Ont.

The Mount Royal Garage Company, Montreal, which has a capital stock of $500,000, is putting up a large garage in Montreal.

The malleable iron works which Hugo Gutenkunst proposes to establish at Owen Sound, Ont., and for which a municipal loan of $60,000 has been approved by the ratepayers are to cost $100,000.

The Toronto Structural Steel Company, Toronto, has been reorganized, the capital stock increased from $100,000 to $500,000, and the plant is to be enlarged.

The Prince Edward Island Cold Storage Company, Charlottetown, P. E. I., has awarded a contract for the building of a plant to cost $25,000.

The American Cyanide Company is building a chemical plant at Niagara Falls, Ont.

Canadian Steel Foundries is erecting a plant at Welland, Ont., to cost $200,000.

The Harriston Gas Company, Harriston, Ont., will double the capacity of its plant.

The Buffalo Brake Beam Company, Buffalo, N. Y., will establish a plant at Hamilton, Ont., in addition to its present plant at Brantford, and Hamilton will be made the headquarters for the company's Canadian business. The company has a contract for supplying brake beams to the National Car Company.

The Stratford Bridge & Iron Company, Thomas Holliday, Stratford, Ont., manager, is completing plans for building a new plant there.

The Canadian Steel Foundries, Ltd., Welland, Ont., has plans under way for extensive additions to be made to its plant. These include 100 ft. extensions each to the main building and storage building and an extension of the foundry building; new building, 50 x 125 ft., for an 18-in. mill; new hot beds in the 12-in. and 22-in. mills, two billet heating furnaces, one busking furnace, a 25-ton basic furnace, a 35-ton traveling crane, new power and air compressing systems, new sewerage disposal plant, etc. The estimated cost of the improvements is about $200,000.

Western Canada

WINNIPEG, MAN., September 27, 1912.

The local machinery business is a little quieter as far as placing new orders is concerned. The different houses, however, are busy shipping out materials that have been accumulating on the books. Some concerns are holding back on proposed extensions to plants until the final result of the western Canada harvest will be known. The weather has been more favorable for threshing this week, however, and the trade feels confident that no serious injury to the crop or to business will result from the lateness of the harvest. Congestion of traffic this fall seems to be inevitable.

The Great West Wire Fence Company, Ltd., of which Thomas Black of Winnipeg is the president, is about to begin work on the building of a factory at Fort William. The plant will cost about $100,000.

The Diamond Flint Company, Ltd., Toronto, Ontario, will establish a glass bottle factory at Redcliffe, Alberta. The sand at that town is said to be very suitable for such an industry.

The Canadian Puget Sound Lumber Company, Victoria, B. C., whose mill burned a short time ago, has let a contract to Parfitt Bros., Victoria, for the construction of big additions to its plant at Rock Bay, near that city. It will include a sash and door factory and a planing mill.

The City Council of Vancouver, B. C., has ordered that lumber mills there install sawdust burners before January 1.

A. W. Grant and P. E. Montanas, inventors and holders of a plow patent, are negotiating with the board of trade of Bassano, Alberta, to establish a manufacturing industry there. A company is being organized in the town for that purpose.

The town of Tofield, Alberta, will spend $25,000 on waterworks, and $43,000 on gas distribution. The mayor is J. C. Letourneau.

The Call Switch Company, Vancouver, B. C., will erect a factory at Coquitlam, B. C., at a cost of $250,000. The Coquitlam Construction Company is the general contractor.

The Dominion Safe Works will erect a factory at Eburne, B. C. E. Sproat is the architect, and Barwick Bros. the contractor.

The town of Duncans, B. C., is to spend $100,000 on extensions to waterworks and power plant. The engineers are Dutcher, Maxwell Co., Vancouver.

Government Purchases

WASHINGTON, D. C., September 30, 1912.

The Paymaster General, Navy Department, Washington, will open bids October 15, schedule 4844, for one open-type combined feed-water heater and meter, one steam trap with accessories, 12 separators, one cast-iron exhaust head, one receiver and pump, four feed-water regulators, two boiler feed pump governors, four automatic angle type triple-duty emergency boiler outlet valve and one twin-feed water filter and grease extractor.

The Treasury Department, office of the supervising architect, Washington, will open bids October 18 for furnishing the air-lift pumping plant at the United States post office, London, Ky.

The Bureau of Yards and Docks, Navy Department, Washington, opened bids September 21 for furnishing one 15-ton single trolley traveling crane, manually-operated, as follows:

Manning, Maxwell & Moore, New York, $1,796 and $1,666; Niles-Bement-Pond Company, New York, $2,150; Whiting Foundry Equipment Company, Harvey, Ill., $1,700.

Bids were opened at the Bureau of Supplies and Accounts, Washington, September 24, for material and supplies for the navy yards as follows:

Schedule 4802, class 12, for delivery to Boston, one surface sanding machine—Bidder 2, American Woodworking Machinery Company, Rochester, N. Y., $925; 6, Berlin Machine Works, Beloit, Wis., $835; 41, J. A. Fay & Egan Company, Cincinnati, Ohio, $900; 102, H. B. Smith Mfg. Company, Smithville, N. J., $1,350; 139, Manning, Maxwell & Moore, New York, $1,400.

Schedule 4803, class 13, for delivery to Norfolk, one Berlin No. 283 band resaw—Bidder 2, American Woodworking Machinery Company, Rochester, N. Y., $1,468; 6, Berlin Machine Works, Beloit, Wis., $1,395.32; 41, J. A. Fay & Egan Company, Cincinnati, Ohio, $1,123.95; 83, William D. Mersham & Co., Saginaw, Mich., $1,563.70; 139, Manning, Maxwell & Moore, New York, $935; 10, M. K. Bowman-Edison Company, New York, alternate.

Class 14, one wall radial countersinking and drilling machine—Bidder 20, Cleveland Punch & Shear Works, Cleveland, Ohio, $735 and $760; 43, Walter H. Foster Company, New York, $1,615; 75, Maloney Electric Company, St. Louis, Mo., $399; 139, Manning, Maxwell & Moore, New York, $1,095.

The Gould Coupler Company, Depew, N. Y., has commenced work on an addition, 90 x 700 ft., to be used as a chipping and cleaning room and relieving foundry floor space now used for that purpose. The McClintic-Marshall Construction Company, Pittsburgh, has the general contract for its erection, including the furnishing of 1000 tons of structural steel. All necessary equipment and machinery have been purchased, including four 10-ton electric cranes. It is expected that the addition will be in readiness for operation about November 1.